The

Electrical Review

VOL. CII. MAY 4, 1928. No. 2,632.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

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Telegraphic Address "AGEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 7672 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Tendencies in Electricity Supply.

WE pointed out a few weeks ago that, while a period of great activity undoubtedly lay before the electrical industry, care and co-operation would be needed, to ensure that this activity should be healthy and profitable to those engaged in it.

The Government has seen to it that co-operation shall prevail with regard to the generation and distribution of electrical energy. The Electricity Commissioners, the Central Electricity Board, and the Joint Electricity Authorities which have been created, exist for the purpose of combining resources, promoting efficiency, and making the best possible use of the means now available for extending the supply of electricity into all parts of the country.

Electricity is now regarded as so necessary to the comfort and well-being of the householder, that electric light is installed as a matter of course in practically all new house property. Electricity undertakings are increasing the number of consumers connected, the average load of each, and the consumption of energy per installation, to an extent that would have seemed fabulous twenty years ago, or less. It is generally agreed that the domestic load contains possibilities of potential development in excess of the industrial power load; and the penetration of electricity into the homes of the people, for purposes other than lighting, has hardly been seriously started. The use of electricity for power, though considerably more advanced, is capable of enormous further developments; while its use for agricultural purposes, if carried to the point at which it has long stood in Sweden, would provide yet further outlets for the sale of electrical energy.

The great municipalities are continually extending their borders, and pushing out their lines and cables into surrounding districts. Existing power companies have sought, and are seeking and obtaining, powers for distribution over large areas, comprising whole counties. These developments are to be regarded as natural, legitimate, and in the direct line of what has gone on, with increasing speed and momentum, since the earliest days of electricity supply.

The prospects of enormous electrical development

have, not unnaturally, attracted the attention of financial circles; and, in addition to these normal increases, it will not have escaped notice that another method of development is being carried out, which is something of a novelty in the electric supply world, at least in this country. Financial control is secured of groups of small existing companies, which, up to the present, have not been remarkable for farsighted and progressive policies. To such an extent has the universal necessity of electricity now been recognised, however, that companies whose shares, before the war, were at a considerable discount, have seen them rise, in spite of excessively conservative management, to par and above. When the control of such companies is acquired, the price paid sometimes appears fantastic, when past records are examined. In cases of this kind, one cannot help wondering what is going to be the course of events in the future. Investments are made in the hope, and with the intention, of earning dividends. Dividends are dependent in the first place, upon revenue, and in the next, upon costs. If the capitalisation is high, the margin between the running cost and the selling price of the unit of electricity must be large in order to provide an adequate return upon the capital. Unless investors are philanthropists, which is not usually the case, high capitalisation means high prices for electricity. High prices for electricity means slow development of load, the retention of out-of-date plant long after its period of usefulness has come to an end, and general stagnation. Successful and profitable trading demands that the commodity offered shall be sold at a price not lower than its cost of production, and not so high as to cause the customer to buy some alternative product, or to do without altogether. Electricity must be sold at a price which yields a profit over the cost of generation and distribution, and which is, at the same time, not so high as to cause the consumer to use gas or oil, or to do without power or artificial light. The total cost includes, of course, overhead charges, and the greater the output the less are the overhead charges on each unit of output.

Increase of the amount of capital available for development can only do good. Many small undertakings have stood still, comparatively speaking, for years, on account of the lack of the necessary capital to improve their systems. It is the sinking of large sums in the purchase of shares at prices beyond the dreams of their owners that causes one to wonder what new factors exist, beyond those apparent to everyone, that did not exist before.

Economists have shown that some of the most important items in our national balance sheet are those known as invisible exports. Among the foremost of these is the return obtained from British capital invested abroad. If it is a good thing for the nation that our capital should be used for the promotion of commercial enterprises overseas, is it also a good thing that capital from foreign sources should be used for the promotion of commercial enterprises in this country?

The Overhead Line Regulations.

On Thursday last week the new code of Overhead Line Regulations was issued by the Electricity Commissioners, and copies were dispatched, with an Explanatory Memorandum, to all authorised undertakers in the country. The code is not in a draft or tentative form—it is already in force as from April 16th, and will presumably govern the construction of overhead lines for some years to come; its predecessor, which, in spite of its defects, represented a material improvement upon the old Regulations, was issued in 1924, and it has been no easy matter to induce the Commissioners to move in the direction of revision. However, thanks to the efforts of the I.M.E.A. in the first instance, of the Institution of Electrical Engineers at a later date, and, finally, of the Overhead Lines Association, which was formed as a last resource by engineers to whom the question was of vital importance and urgency, the Regulations have been revised, with a view to their relaxation, "for the purpose more particularly of facilitating the development of overhead distribution at the lower voltages in rural areas," as the Memorandum has it. That the Commissioners were in sympathy with the movement to that end they plainly showed in their annual reports, but they were avowedly hampered by the consideration that the existing Regulations had been adopted in accordance with the recommendations of a Committee purporting to represent the electrical industry. But that section of the industry which was most intimately concerned with the application of the Regulations forcibly demonstrated its dissatisfaction with the code which has now been superseded, and the common-sense decision of the Commissioners to hold conferences with "electrical engineers who have had considerable experience in the erection of overhead lines in rural districts and elsewhere" (to quote again from the Memorandum) was cordially welcomed. We hope that the precedent will be followed in the future; there is no essential reason why the Regulations should not be revised at more frequent intervals, as experience of their working is acquired, and it is undoubtedly most important that no restriction which can safely be dispensed with should remain in force any longer than is unavoidable.

Elsewhere in this issue we summarise the points of difference between the old and the new Regulations, and at our request Mr. W. Fennell, chief engineer to the Mid-Cheshire Electricity Supply Company, who has played a leading and effective part in promoting reform of the code, has expressed his views regarding the nature and extent of the improved facilities that have been provided. At first sight it will probably appear that the concessions made by the Electricity Commissioners are somewhat scanty; certainly, in our opinion they do not err on the side of excess. It must be admitted, however, that they are sufficient in the aggregate to exercise a substantial influence on the cost of construction; in particular we may refer to the reduced ice loading, the lowered minimum clearance height (which is all that could be desired), the abolition of guards, and the use of poles other than red fir. The procedure for obtaining permits from the Commissioners has also been simplified and cheapened. Moreover, outside the Regulations proper, the Commissioners have secured important concessions from the Postmaster-General in respect not only of procedure, but also of technical requirements, and they have relaxed the limits of voltage variation in rural areas. On the whole, there is much to be thankful for.

It should always be remembered that the object of these Regulations is "the maintenance of a reasonable degree of safety to the public," and we would emphasise the word *reasonable*. Absolute safety is unattainable; even the means prescribed to ensure safety may prejudice it (witness the fact that lives have been lost as a direct result of employing guards under live wires). We are confident that the new Regulations in no way threaten the safety of the public, and we hope that eventually in some respects still further improvements will be effected in the code. That will be possible if the Commissioners keep in touch with the expert opinion of those who erect, and are personally responsible for, overhead lines.

In conclusion, let us point out that the letter of the Regulations is one thing: the spirit is another. The Commissioners in the past have shown themselves willing to sanction departures from the strict letter of the law in circumstances which, in their opinion, justified that course, and we believe it is not their wish that the rules should be rigidly obeyed and enforced. It is their duty and their aim to *promote* the extended use of electricity, and it is part of the national policy to distribute electricity throughout the rural as well as the urban areas. Hence the Regulations should be interpreted with a liberal bias towards simplicity and economy, and whenever it appears to be to the public advantage that some variation should be made, undertakers should invite the Commissioners to exercise the discretionary powers with which they are endowed.

Mr. Claude Johnson's Retirement.

THE retirement of the founder of a business from active interest in the concern, the growth of which in size, in the variety of its products, and above all in honourable reputation all over the world, he has watched with pride, is not an event to be lightly passed over. We know well enough that this is the day of very large companies capable, because of their size, of operating both as bulk producers and carrying out big and comprehensive contracts, characteristic of the times that we have reached. But those who know the industry best will readily place their finger upon concerns which began with a single individual—or perhaps two or three—were carefully nursed by them along lines appropriate to days other than these, and are now successful among the comparatively smaller companies or firms because they have maintained command and have gathered about them associates who took a real interest in the undertaking, and assisted it in its adaptation to changing methods and changing manufactures. The story of Mr. Claude Johnson's early work in conjunction with Mr. Phillips—as Johnson & Phillips—is told upon another page to-day. Mr. Johnson leaves the company, as he leaves the industry, grown from small beginnings to an important position in the world. His entire working life has been devoted to the development of both, and his labours for his company in particular may fairly be claimed to have played their part in the progress of the industry in general. The ELECTRICAL REVIEW, which has been in touch with the company during the whole period of its existence, offers to Mr. Johnson as he enters upon his well-earned retirement, many years of quiet happiness in which to note the continued prosperity of the company.

By an interesting coincidence, Mr. Johnson's retirement from the chairmanship of the company takes effect as Mr. Macgregor celebrates his jubilee with the concern. We are sure that Mr. Johnson, as he goes into well-earned retirement, has the cordial and sympathetic good wishes of his many friends in the electrical world, and that Mr. Macgregor, as he takes up the joint chairmanship and managing directorship, does so in confidence that his ripe experience and knowledge of the business itself and of the electrical industry in general will secure a position of stability and prosperity for Messrs. J. & P. for many years to come.

The Reorganisation of Electricity Supply.

ELSEWHERE in this issue Mr. J. W. Thomas draws attention to the probable effects of recent legislation on the future relations between employers and employed, as regards the maintenance of continuity of supply and also as regards the circumstances and prospects of the technical staffs of electricity supply undertakings. Both these aspects of the subject are of particular interest to central-station owners and operators, in view of the fundamental changes in organisation and plant that are foreshadowed by the Act of 1926. We have already commented upon some features of the matter, and have pointed out that whilst, as Mr. Thomas urges, preparations should be made in good time to cope with the new conditions, the changes must necessarily be gradual and be spread over a long period of years, so that central-station staffs have no occasion for undue nervousness.

We do not anticipate that the concentration of generation in a smaller number of power stations will materially increase the probability of interruption of supply by strike action. So far as the technical staffs are concerned, we believe the strike policy is in the last degree distasteful to them, and their definite resolve never to strike about matters external to their own immediate interests was fully vindicated in 1926, when they declined to be implicated in the General Strike and loyally carried out their duty in the service of the public. As regards the manual workers, the number of these employed in essential capacities in the power stations of the future will continually tend to decrease relatively to the output of energy, and thereby their importance as a potential cause of stoppage will be reduced; moreover, the spirit of the manual trade unions has undergone considerable modification since the General Strike, and whilst, no doubt, differences of opinion will arise in the future as in the past, we do not think they will be so likely to culminate in open conflict. The closer relations referred to by Mr. Thomas should be fostered, and peace within the supply industry must be safeguarded as effectively as possible.

Too little importance is sometimes ascribed to the influence on the economy and reliability of electricity supply of goodwill on the part of the technical staff. That can be created and maintained only by wise management and fair dealing, and as Mr. Thomas truly states, it is of greater value to the undertaking than local economies. In peace as in war, it is the man and not the machine that finally decides the issue, and the ethics of management is at least as important as the economics.

Daylight and Artificial Light.

THE discussion opened by Mr. J. S. Dow on this subject, at the last meeting of the Illuminating Engineering Society, dealt with several problems on which some difference of opinion seems to exist. Few people, we suppose, would subscribe to the view that the ideal of artificial lighting is the imitation of daylight. Illuminating engineers realise that daylight, as usually received in buildings, has many faults, which need not be perpetuated. But as artificial light is so constantly used not only as a substitute for, but also as a supplement to natural light, there does seem to be some reason for advocating the wider use of illuminants furnishing a light visually indistinguishable from daylight, provided that the absorption of light is not excessive. This method might be used with advantage in many offices, where at present a mixture of natural and artificial light is frequently employed. There seems to be ground for the belief that a visual imitation of daylight is, on the whole, favourable to sustained close work. Possibly, as Mr. Dow suggested, this may be explained by the results of the chromatic aberration of the human eye, though the experiences of long-sighted and short-sighted people seem to differ. One is glad to observe that illuminating enginers are now directing their attention to the effect of *quality*, as compared with *intensity* of light. Whilst we do not share the extreme views of those who are disposed to attribute eye-strain mainly to the habitual use of artificial light, we agree that the differences between natural and artificial light deserve scientific study; and it is quite possible that the colour of light may play a much more important part in the illuminating engineering of the future.

The Relief of Productive Industry.

AFTER many years—it might even be said over 300 years—there is a prospect of a burden upon production being removed to a great extent. We refer, of course, to local rates, with which Mr. Churchill has dealt in his 1928-29 Budget. While the effects of the proposals will not be observable for a long time yet—the actual relief itself will not commence until October, 1929—it is generally felt that the changes will be of considerable immediate benefit to our industries, and especially to those which have to meet severe foreign competition, such as the electrical industry. The relief is not a subsidy, but a recognition of the fact that it is absurd to tax the tools of industry, especially when those tools are unable to earn the money to pay the rates.

Mr. Churchill emphasised in his speech that the Government measure would not restore prosperity, but would act as a spur to greater efforts by industry itself. Industry has had so little encouragement in recent years, that this easing of the burden should prove a stimulus of no ordinary kind.

A Floating-Dock Electrical Installation.

A brief account of the electrical equipment of the Singapore Floating Dock, which is probably unique in some respects as the result of many difficulties that were met with in the lay-out.

THE building and equipment of the Singapore floating dock by Messrs. Swan, Hunter and Wigham Richardson, Ltd., at their shipyard at Wallsend-on-Tyne, for the Admiralty in about 12 months, constitutes a record which is a valuable testimony to British engineering. That electrical engineering has taken its full share in the work, and with equal credit, was evidenced on the occasion of a visit to the dock on Friday last by the North-East Coast Centre of the Institution of Electrical Engineers, after which Mr. Ernest T. Williams, O.B.E., M.I.E.E., assistant director of electrical engineering to the Admiralty, read a paper describing the equipment to the Centre.

The following notes are based on the comprehensive and detailed description of the equipment given by Mr. Williams, and on some impressions gained of the installation during a visit to the dock for the purpose of taking photographs of the apparatus, by the kind and special permission of the Admiralty.

Briefly, the structure consists of a floor and two sides or walls, with open ends, forming an avenue in which the ships are to be housed for repair. The floor and the bottom portions of the walls are constructed of a number of tanks into which water is allowed to flow, or from which it is pumped, for the purposes of sinking or raising the dock respectively. It has a lifting capacity of 50,000 tons, and is 855 ft. long, 172 ft. wide, and 50 ft. high above the pontoon deck. The towage of this enormous structure in two parts to Singapore, *via* the Suez Canal, which will be temporarily closed for traffic for this purpose, will be followed with great interest.

In considering the electrical equipment of the dock it had to be borne in mind that in reality it was a self-contained miniature dockyard, capable of undertaking the docking and repair of the largest ships, and supplying them with certain essential services while in dock. The tops of the side walls are working quays, while the upper parts of the interior of the walls contain workshops, power plant, and accommodation for the dock staff. The dock had to be built in sections for launching purposes, and these sections are capable of being taken apart for self-docking purposes, conditions which complicated the designing of the electrical installation.

Fig. 1.—Diesel-engine Room, showing 250-kW Set.

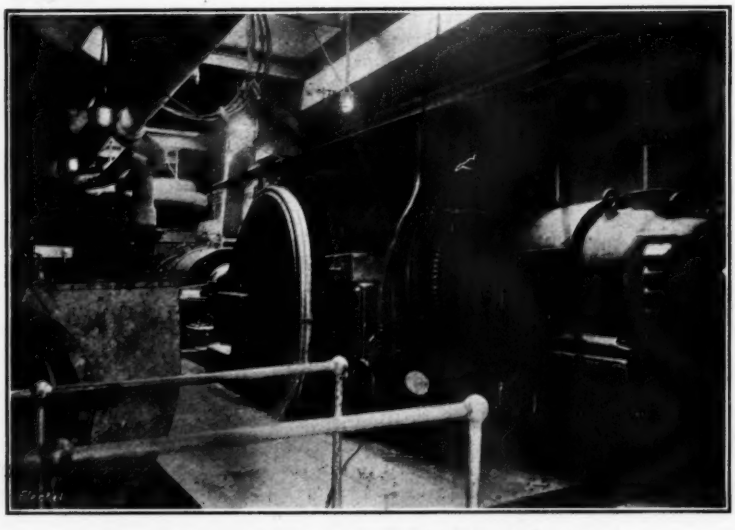

Fig. 2.—Forward Turbo Room; 1,000-kW Set in Rear.

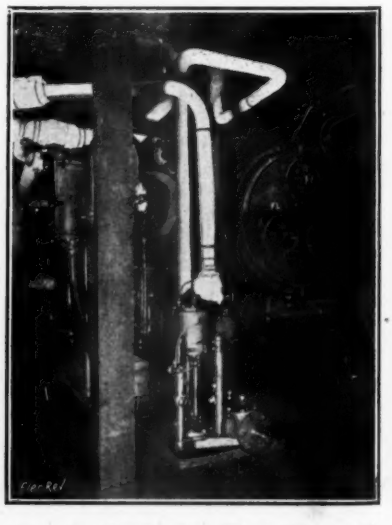

Fig. 3.—Condensing Plant (Forward).

In order to meet most conveniently the differing power demands on the dock, which will vary from a few kW for lighting and maintenance, when the dock is not in use, to above 1,500 h.p. for pumping alone, when a ship is being docked, and having regard to the essential requirement that any section of the dock can itself be separated from and docked in the remaining portion, there are two separate and distinct electrical systems, one a.c. at 1,000 V, and the other d.c. at 220 V.

The generating equipment comprises three 1,000-kVA, 3-phase, 1,000-V, 50-cycle steam turbo-alternators, and one 250- and one 36-kW Diesel generator sets for supplying d.c. at 220 V. Two steam sets will meet the greatest demand for power. The third set can be used as a stand-by, or to supply d.c. through either or both of two 1,000-volt synchronous motors driving 500-kW, 220-V generators. After the ship is docked and the main pumps are shut down, one turbo-alternator operating through the motor generators will probably be used to supply the load during working hours, while during other periods the 250-kW Diesel set will suffice. When the dock is not in general use, steam will be shut down and the load will be met by the 250-kW Diesel set, fig. 1, during working hours, and the 36-kW set outside these times.

Fig. 4.—Switchboards in Forward Turbo Room.

Steam is provided by four Yarrow-type boilers arranged in two boiler rooms. Each boiler has its independent uptake and funnel, and is capable of evaporating 20,000 lb. of water per hour. Oil-fuel firing is provided for, each boiler being equipped with five 400-lb.-per-hour sprayers, working at 150 lb. per sq. in. Each boiler room is complete with its own auxiliaries.

The turbines and the Diesel engines were supplied by Messrs. Belliss & Morcom, Ltd., the alternators by the General Electric Co., Ltd., and the Diesel-driven generators by Messrs. Crompton Parkinson, Ltd.

The two turbines in the after engine room exhaust into a common condenser below, with shut-off valves intervening, while the turbine in the forward engine room, fig. 2, has its own separate condenser below, fig. 3. The surface condensers are placed in separate chambers below the turbo-generator rooms, and divided therefrom by a watertight deck. Circulating water to each condenser is drawn through the side of the dock by a vertical-spindle centrifugal pump, placed well down in the dock chamber so as to be always submerged, and driven by a single-cylinder steam engine.

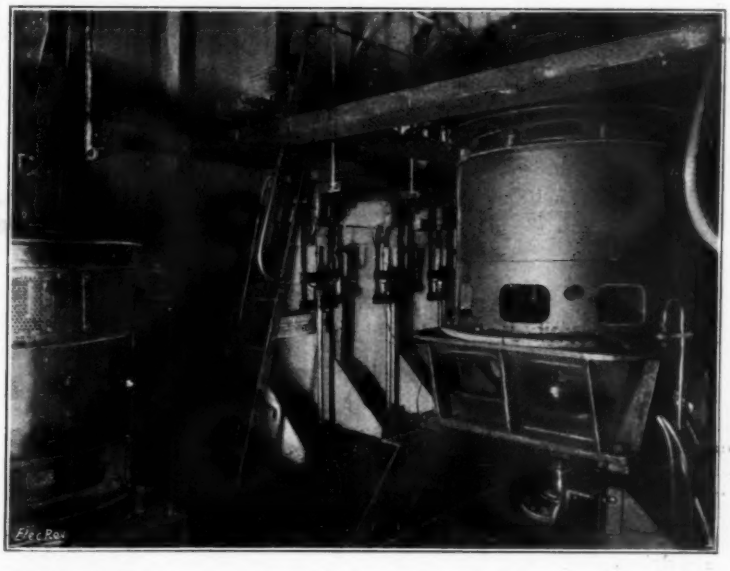

Fig. 5.—A Pump-motor Room, 330-h.p. Main and 50-h.p. Drainage Motors.

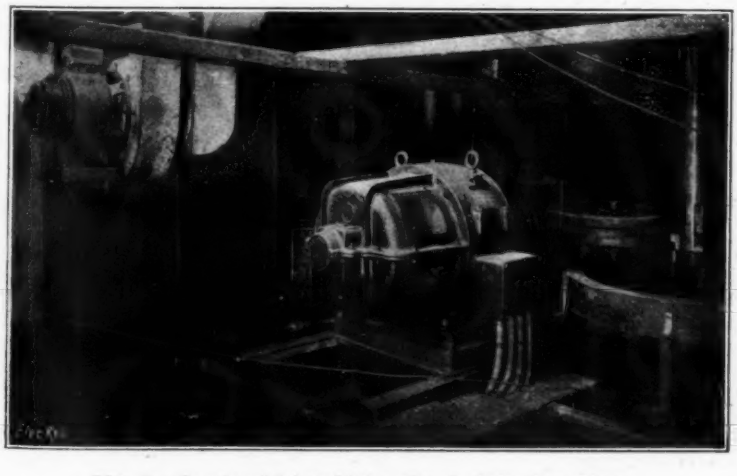

Fig. 6.—Capstan-driving Motor Room; Left, Fan Motor.

There are two main a.c. switchboards, one forward and one aft on the port side. These are of the sheet-steel cubicle type and back against the bulkhead with hinged doors on the front, on which all the instruments are mounted. Fig. 4 shows one of the a.c. boards at the far end; at the near end (left) is one of the d.c. boards. These switchboards run parallel with the turbo-alternator sets in the wall on the port side, with a gang-

way between, and it will be readily agreed that to pack the whole of the equipment (turbo sets and switchgear) away without congestion in a room only 16 ft. wide, the width of the dock walls, is a notable achievement.

Besides serving for the generators, the two a.c. boards also control the supply to the main pump motors and the two synchronous motor generators, while provision is made for paralleling up the two switchboards by an interconnector cubicle at each.

There are four main d.c. switchboards, two in each wall, which are interconnected by a ring main consisting of two 1.0-sq. in. in p.i., l.c. and a. cables per pole. The ring-main connections on the ends of the bus bars are shown in fig. 4.

The two port boards each deal with the supply from one of the 500-kW generators, the supply being taken through an automatic circuit breaker to a pair of change-over links which in one position feed a battery-charging cubicle, and in the other position are connected to the double-pole, double-throw switch, which is electrically interlocked with the generator circuit breaker to prevent opening on load. This switch, in one position, feeds the ring-main busbars, through which all dock feeders are supplied at a constant pressure of 220 volts, and in the other position feeds a "ship dock panel" on the aft port board, at either 110 or

Fig. 8.—The Control Room, or Valve House.

220 volts, from which cables lead to distribution boxes for feeding ships in the dock. To enable the various automatic tripping devices to work on either 220 or 110 volts, a change-over switch is fitted, enabling suitable resistances to be inserted or cut out. The aft starboard switchboard serves for the supply from the two Diesel-driven sets.

All the pumps on the dock are motor driven, the main pumps being fed from the 1,000-volt a.c. supply, and the other pumps from the 220-volt supply. There are in all seven main pumps, three of which have 43-in. suction and delivery branches and are each capable of delivering about 100 tons of water per minute. These are driven by 330-h.p. motors running at 480 r.p.m. There are also two 27-in. pumps, each capable of delivering about 66 tons per minute, driven by 180-h.p. motors, running at 575 r.p.m., and two 20-in. pumps, which will each deal with about 33 tons per minute; these are driven by 94-b.h.p. motors running at 960 r.p.m. The pumps are of the vertical-spindle type, arranged with balanced suction. They are situated in the bottom of the dock and driven through vertical shafting from the electric motors arranged in the motor room. Fig. 5 shows one of the 330-h.p. motors and the control gear. The latter is of the contactor type and arranged for push-button control from the control room. The controllers consist of suitably rated triple-pole stator contactors, fitted with magnetic blow-outs on each pole, together with the necessary d.p. rotor accelerating and final running contactor, under the control of an automatic adjustable time element. The usual control and circuit fuses are provided, and the whole is arranged in a totally-enclosed steel case.

There are four fire and drainage pumps. These are of the vertical-spindle two-stage single-suction type

Fig. 7.—One of the Workshops.

driven by motors through vertical shafting. One of the drainage motors, 50 h.p., is shown in fig. 5.

For towing a ship in or out of dock, or, when necessary, controlling the position of the dock itself, there are eight electrically driven capstans, each capable of exerting a pull of 16 tons at 45 ft. per min., and driven by a 78-h.p. motor, d.c., 220 V, at 630/700 r.p.m. Fig. 6 shows one of the capstan motors. A powerful "Harfield" differential brake gear of special design is fitted, fig. 6, rear; this is totally enclosed and semi-automatic in either direction. Two solenoid band brakes are also fitted at one end of the motor. These brakes are shunt wound and so arranged that one brake comes off at the first movement of the controller, but the second will not come off until current sufficient to hold the load is passed through the motor. The second step on the controller is arranged to pass current corresponding to the full torque to meet this. This step is arranged to give slow

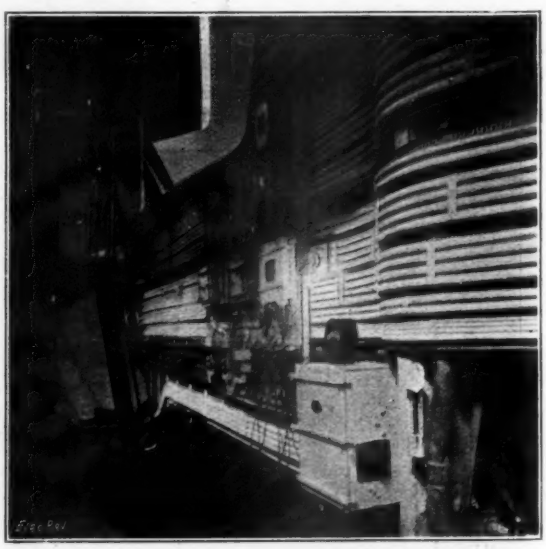

Fig. 9.—Example of Dock Cabling.

speeds for inching when the controller is moved back to it from the later steps.

The control gear consists of a relay reversing controller in a watertight case for mounting below deck,

and resistances of the ventilated pattern, partly combined, and partly separate.

The dock is equipped with four 4-ton travelling wharf cranes, supplied by Sir William Arrol & Co., Ltd.,

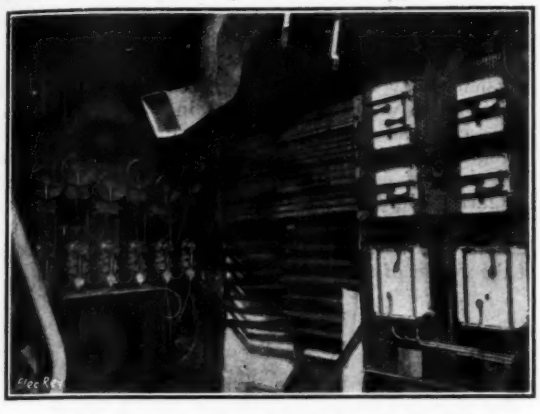

Fig. 10.—"Ship's" Telephones and Small Wiring.

two on each wall, which operate on the 220-volt d.c. supply. Each crane has four motions operated by separate motors as follows: Hoisting, 25 b.h.p., 600 r.p.m.; derricking, 25 b.h.p., 600 r.p.m.; slewing, 10 b.h.p., 750 r.p.m.; and travelling, 25 b.h.p., 600 r.p.m. The

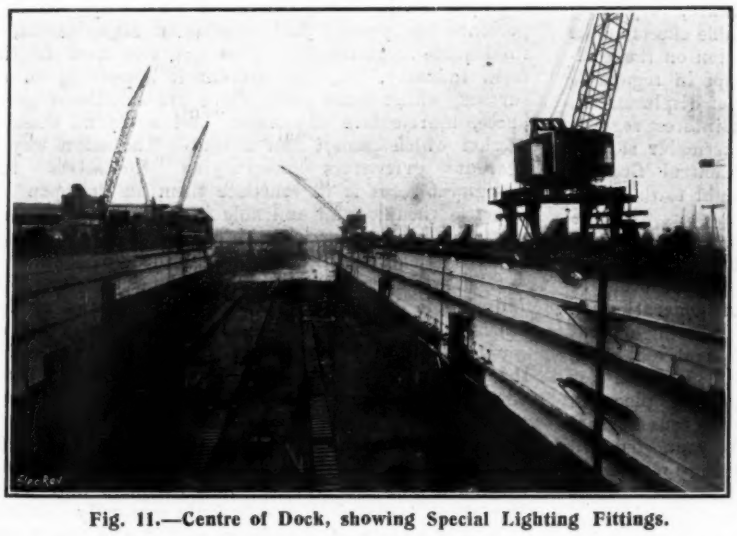

Fig. 11.—Centre of Dock, showing Special Lighting Fittings.

supply is conveyed to the cranes by means of a pair of "H" rails running the whole length of each wall, a foot or so from the deck level. The rails are supported in special porcelain insulators of the firm's own design, which partly contour the rails, fig. 12. The rails are protected by sheet-iron, and the collector shoes run underneath the rails. They are fed direct from the d.c. switchboards, and on each wall there is an emergency push which, when pressed, "shorts" the no-volt coil on the breakers and disconnects the supply circuit.

There is an air-compressor installation on the dock consisting of three Reavell air compressors of the vertical double-acting two-stage type with inter-coolers. Two machines have a capacity of 1,000 cu. ft. of free air per min., and are each driven by a 225-h.p. motor, 220 V, d.c., while the third machine has a delivered capacity of 350 cu. ft. per min., and is driven by a 77-h.p. d.c. motor. The compressed air is required for automatic machinery for repair work, and also for operating the valves for controlling the flow of water into or from the tanks when sinking or raising the dock.

The machinery in the workshops is electrically driven, some of the machines being run from the line shafting and others having separate motors. The main line shafting is driven by one 15-b.h.p. and one 5-b.h.p. motors of the constant-speed type, running at 500 r.p.m., the motors being mounted as usual on adjustable slide rails. Fig. 7 is a view of one of the workshops. One workshop is equipped with two welding bays in which are installed one arc welding plant for general work and one Cyc-Arc welding plant. For the ventilation of the dock there are some 54 fans, representing a total of about 100 h.p.

The lighting installation can be divided into two main portions, *viz.*, that for the lighting of the dock itself and that required in connection with docking operations and for night work. The former calls for no special comment, and follows the usual two-wire rubber-insulated lead-sheathed system with watertight fittings. About 700 lamps are installed. For the lighting of the top of the dock walls, 24 lamp standards 10 ft. high, with 300-watt lamps, are employed. These are limited in height to clear the travelling cranes, and are spaced approximately 60 ft. apart.

The dock walls and the sides of a ship in dock are lighted by 1,000-watt lamps housed in special lanterns, fig. 11. Ventilation for the interior of these is obtained by means of ventilating pipes which pass through the walls into the interior of the dock. The total illumination of the dock aggregates to approximately 90,000 candle-power.

The telephone system consists of a 35-line telephone exchange, and twelve direct line communications. All the telephones are of special Admiralty design, fig. 10, as fitted in the latest warships, and are worked on a two-line insulated circuit, at a pressure of 22 volts.

Probably not the least interesting feature in the electrical equipment is that which concerns the control of the dock as a floating structure.

The raising, lowering and trimming of the dock are governed by the water that is pumped from, or allowed to flow into the various parts of the structure which, as previously stated, comprise a series of watertight compartments. This calls for the frequent and reliable operation of a considerable number of very large valves, the opening and closing of which are effected by pneumatic presses, fig. 5, rear, operated by compressed air, at a pressure of 80 lb. per sq. in. The pneumatic valves controlling the presses are electrically operated from the valve or control house situated on the foremost end of the starboard wall, fig. 8. A press is situated above each of the sluice and flap valve rods, to which it is connected, and its movement is indicated in the

Fig. 12.—Crane Rails Supports.

valve house by means of a circuit breaker controlling an indicator. When the valve slide or switch in the valve house is operated, the exhaust passage is closed, and the inlet opened, and air passes into the press through a ¼-in. pipe, thereby lifting the water valve. By suitably proportioning the inlet, the press

can be made to work as slowly as desired. All the time the magnet remains energised the water valve is lifted, but as soon as the current is cut off by the movement of the valve slide, the valve closes by gravity and expels the air from the press.

It is interesting to note that nearly 13,000 electrical connections, including those in the disconnecting boxes at the several dock sections, have been made in joining up the valve control system. The complete apparatus was supplied by the Westinghouse Brake and Saxby Signal Company, and erected by the dock builders. The necessary current for this system, and also for the telephones, is supplied by two 1-kW motor-generators at a pressure of 22 volts. Secondary batteries of 100 ampere-hour capacity are also provided as a stand-by. The small motor-generators have a voltage range of 22-23 V to permit of charging the secondary batteries.

The cabling work throughout the installation as a whole is worthy of particular attention. Generally, the cables and conduits are cleated or bracketed up the "inside" of the dock walls. An excellent example of the cable work, of which the installers are very proud, is shown in fig. 9. The cables include those of the telephone, power and lighting systems; the "dis. board" includes power and lighting distribution boards, and telephone relay boxes. Where the cables cross the dock from wall to wall, they are run in "trunks," about 6 ft. high by 4 ft. wide, constructed through the tanks in the walls and floor. At the two ends, there is a vertical drop of 45 ft., and to prevent drainage of the insulating oil, the cables (p.i.) have been specially impregnated. In each drop there are two bulges in the wall to which the cables are cleated, which take some of the weight of the cables.

Labour and the Electricity Act.

The author discusses the possible effects of the closing of "super-stations" through strikes or lock-outs, and urges the provision of complete arbitration and conciliation machinery. The alteration of the basis of staff salaries is also dealt with.

By J. W. THOMAS, LL.B., B.Sc., A.M.I.E.E.

AS far as the present writer is aware, very little has been written as to the probable effects of the recent electricity supply legislation on the staffing arrangements in the industry, except in regard to the question of compensation in case of displacement. Most staff engineers have displayed some interest regarding their probable position if their particular station is closed down as a result of the Central Board's schemes, but few have given much thought to the other effects of the Act. A little reflection, however, will convince anyone that they are likely to be many and varied. Perhaps the most important will be the increasing vulnerability of the industry in the event of labour troubles. The concentration of generation in a few large power stations will mean that huge areas will be entirely dependent upon a comparatively small number of stations. These stations will be vital key positions, because if any disturbance takes place in them which jeopardises their supply, the consequences as regards the system to which they are connected will be almost unimaginable. Under the linking-up schemes, though an undertaking owning a selected station may be self-contained as far as its relations with its own staff are concerned, from the point of view of generation and supply of electricity it will be only a part of a huge system. Thus, it will be almost impossible to isolate a dispute which may arise between it and its employés, as any interruption of supply will affect not only the area covered by the undertaking itself, but the system of which the station forms a part. Any attempt to afford assistance to the undertaking affected may lead to outbreaks in other stations, and thus the area of conflict will spread with inevitable disturbance to the industry as a whole. Consequently, large areas will be at the mercy of the combatants, and the communal injury which is done will be out of all proportion greater than that resulting from a stoppage in the manufacturing industries. If it is to prevent interruptions, the industry has the choice of two alternatives: either the suppression of all organisation, or such complete organisation, with machinery for arbitration, as shall make the possibilities of strike action negligible. There are no doubt a few undertakings (and one is not sure whether one ought not to include amongst them some of the London companies), which would prefer the former state of affairs, but the more sensible amongst them will much prefer the latter arrangement. In any case municipalities are debarred under the Trade Disputes Act (1927) from actively interfering with the organisation in Trade Unions of their employés. Experience has proved that absence of organisation, or inadequate organisation, does not eliminate friction from industry. It may prevent it appearing on the surface, whilst underneath there are smothered grievances, inarticulate discontent, and all-round dissatisfaction which cannot find a vent. The safest way to prevent grievances magnifying themselves into malignant sores is to ventilate them in the open and to settle them on an amicable basis without resorting to the use of force. The more effective the organisation and the machinery, the less the likelihood of conflict.

It is no exaggeration to say that the electricity supply industry is destined to become, if it has not already reached that stage, the most vital industry in the country, and one in which an interruption will inflict the greatest hardship in the shortest time. A few years ago railway transport might have claimed to be the most vital industry in the country, but to-day it has a competitor in the shape of motor transport which, as the General Strike clearly showed, can take its place to a limited extent and thus prevent complete dislocation. But there is no similar substitute generally available to take the place of electricity, and if a complete area were deprived of its supply, the dislocation would be more complete, and the public injury much more widespread than would be the case with the railways.

It is doubtful whether the right to strike or lock out ought to be abrogated altogether, since this is the foundation of negotiating power, and whilst it is retained there can be no absolute guarantee against interruption. But short of this, steps can be taken to ensure that there is full deliberation before an outbreak occurs, by the creation of complete machinery for negotiation and by guarantees, to be forthcoming from both sides, that they will utilise the machinery to the full, before threatening a stoppage. No matter how efficient machinery is, however, there are always to be found in every industry employers who will not toe the line to a national agreement, and trade unions which occasionally kick over the traces and ignore the proper channels through which their grievances ought to be ventilated. The former can best be brought into line by granting to the Industrial Councils of the industry compulsory powers on the lines proposed in the Industrial Councils Bill of 1924. The latter could be dealt with by imposing a penalty for a breach of agreement, either by making them forfeit a sum of money, by the loss of privileges of employment, or by denying them the pro-

tection of the Trade Disputes Act, 1906, in the event of their striking before using the machinery of conciliation, as suggested by the Liberal Industrial Inquiry. Such provisions would practically eliminate the possibilities of stoppage.

The legal enforcement of the decisions of the Industrial Councils would have the further advantage that it would tend to produce greater uniformity in the payment of the minimum wages and salaries laid down for the industry. Such uniformity is very desirable in view of the financial provisions of the 1926 Act, relating to the sale and purchase of electricity to and from the Central Board. Under Section 7, it is the cost of production which determines the price paid by the Central Board to the undertaker owning a selected station for the electricity which is generated for the grid, and the same cost of production is the determining factor in calculating the price which the owner of a selected station has to pay to the Central Board for the electricity which he requires for his own purpose. This cost of production includes the items wages and salaries. Thus, the price at which an undertaking which owns a selected station is able to obtain its supply from the Board is dependent to some extent upon the wages and salaries it pays to its staff in the station. It is obvious, therefore, that if such an undertaker does not pay the rates laid down by the Industrial Councils of the industry, it is deriving an unfair advantage, as compared with similar undertakings which do conform to the national scale. Similarly, under Section 14, the question whether a generating station (not a selected station) should be closed down or not will depend upon whether that station can generate its electricity at a cost below that at which it can be supplied by the Central Board. In this case again, wages and salaries are items which count in determining the costs of generation, and thus an undertaking which is not paying the rates laid down by the industry may be reaping an unfair advantage, and may be standing out against the Board, whereas, if it conformed to the appropriate schedules, its costs would be such as to justify the Commissioners in deciding that it ought to be closed down and be compelled to take a supply from the Board. It may be noted also, that the question of wages and salaries paid by the owner of a selected station to his staff is a matter of concern to outside undertakers who receive supplies from the grid, as these items will be reflected in the prices which are charged to other undertakers in the area, for their energy. These undertakers will be entitled to be supplied in accordance with a tariff, to be fixed by the Central Board from time to time, and this tariff will take account of the cost of production, which in turn includes wages and salaries. Thus, if the owner of a selected station pays excessively high salaries, he will do it at the expense not only of his own undertaking, but also of other authorised undertakers in the vicinity. This again is another argument in favour of uniform salaries and wages for the industry.

The method of determining the salaries of the technical staffs will also call for revision. The schedule of the National Joint Board which is at present in operation was framed when the industry was composed almost entirely of self-contained undertakings, possessing one or two stations with a distributing network entirely independent of other supply authorities. Only on the north-east coast was there a large system having several stations linked together and supplying large areas. Thus it was comparatively easy to base salaries on a simple and readily determinable factor, *viz.*, plant capacity (or as an alternative, maximum load), as it was fairly accurate and safe to assume that as this varied, the responsibility of the staff varied proportionately and thus entitled them to an adjustment of salary. The implications underlying the schedule are that salaries depend upon responsibility, and that responsibility varies with capacity. Thus, it was not an unreasonable arrangement to equate salaries with plant capacity, both in regard to the generating and the distribution staffs. Under the new legislation, the self-contained unit of generation and distribution will gradually disappear, and instead of having isolated networks, there will be huge systems along which blocks of power are being transmitted. Thus, whilst it may be possible to continue to base the salaries of the generating staffs on plant capacity, it will be extremely difficult in many cases to apply such a method, in the case of mains and district engineers, on account of the difficulty of assessing the basis either of kW capacity or max. demand in the area of which they are in charge. It is not proposed to discuss here what alternative methods can be employed, still less to argue that no method of determining salaries can be devised. As a matter of fact several methods might be suggested, and whilst none of them perhaps can be as simple as the plant capacity basis, the difficulties of finding some other basis are not insuperable, provided that it is kept in mind that what is required is some standard which approximately determines the amount of responsibility, as this is the best criterion in assessing salaries.

The effect of the new legislation on the personnel in the industry also cannot be neglected. It is too early to predict whether there will be a reduction in the total number of men engaged in the industry, but it is fairly reasonable to assume that there will be a diminution in the number of staff men employed on the generating side. This will bring about a shifting of the balance from the generating stations to the mains, and may mean a transfer of many men from one to the other. In this connection it is desirable that there should be set up a kind of clearing house whereby transfers can be effected where possible and an unnecessary amount of displacement avoided. It will not do merely to let things muddle along as the tendency has been in the past; active steps should be taken to see that the changes which are likely to take place are anticipated, and arrangements made so as to reduce the amount of hardship to a minimum. The National Joint Board has recognised the desirability of such a body being set up, and it has appointed a National Displacement Committee whose functions will be to keep records of changes which are likely to occur, and of men who are likely to be displaced, so as to bridge the gap where possible between displacements and vacancies. Such a Committee cannot but have the approval of the Central Board, as it must not be lost sight of, that if unnecessary displacements take place and compensation has to be paid on a large scale, it will prove an expensive business for the industry out of which, in the last resort, the compensation has to be paid.

In conclusion, it is obvious that the linking-up of systems will make it necessary that the relationships between the staffs in the various undertakings, and particularly those which own selected stations, should be as harmonious as possible. Co-operation and team work will have to be real, and not mere eye-wash and window-dressing. It will, in fact, be the most important feature in maintaining efficiency and reliability, compared with which the extra 1 or 2 per cent. obtained in the boiler house of a single station will be a mere bagatelle. Men will have to be in constant communication with engineers employed by other undertakers, whom probably they will never have a chance of seeing unless they meet them under the auspices of their organisation. It does not require much demonstrating, that the relationships between the staffs on various undertakings are not likely to be amicable if the members in one station are not organised, while those in the other stations are. Experience is therefore likely to show that the full benefit of co-operation, which is so essential under the new legislation, can only be obtained, provided there is complete organisation throughout the industry.

Polish Foreign Electrical Trade.

During February last the imports of electrical apparatus and material into Poland were valued at 7,561,000 zloty (£174,000), and the exports of this class of goods reached a value of 108,000 zloty (£2,500).

The Budget, 1928-29.

Rating Reform Proposals: Relief for the Productive Industries.

ON Tuesday last week, Mr. Winston Churchill, Chancellor of the Exchequer, introduced his Budget for the current year. It is generally agreed that in its construction and in the way in which it was presented, it forms a historical addition to its many noteworthy predecessors.

With an ingenuity differing vastly from that which characterised his last Budget, the Chancellor has put forward several new principles, one of which at least, that covering the field of rating relief for certain national industries, is revolutionary in conception and likely to have a profound effect upon the future of not only those industries immediately affected, but upon that of the whole of British industrial activity.

Mr. Churchill has adopted for the first time, a new method of presenting the figures by which the immense total is reduced considerably. The self-balancing items have been omitted—or at least, only the differences between revenue and expenses are shown. In this way the Post Office, for instance, is represented in the accounts only by its estimated surplus.

In the course of his speech, Mr. Churchill explained how the past year's surplus of 4¼ millions was realised. He said that 10½ millions had been saved by means of an active economy campaign, carried on during the year in the Civil Departments. At this stage he presented another revolutionary principle, stating that it was no longer to be accepted that the Departments had merely to expend the moneys voted to them. On the contrary, he hoped that "the obligation to save money wherever possible, in every detail of administration and at every period of the year, will be accepted as an abiding and perennial rule in our affairs"—a statement which *The Times* justly punctuates with "(Cheers)." In the same spirit, he announced that it had been found possible to reduce the number of officials by over 7,000 in three years, and during the next four years a further 11,000 posts were to be suppressed.

Coming to the income tax, the Chancellor said that the past year had been disappointing, and the decline in the receipts as compared with 1925 from that source, reflected the continuation of the effects of the coal stoppage upon industry. The most important passage of the speech was that in which the Government's proposals for the reform of the rating system were put forward. Mr. Churchill pointed out that our existing rating methods dated from the Elizabethan period, and were wholly inadequate to present-day needs. It was essential that the burdens which were borne by the basic industries of the country should be removed. Their removal would not constitute an injustice to other industries, for they were invidious burdens which the basic industries should never have had thrust upon them. He repeated what has been said so often of recent years—that it was precisely in those districts which were most impoverished and depressed, that the rates were highest. Thus it came about that there were businesses which were actually paying more in rates than they were earning in profits, and paying them out of dwindling capital. Industry was shunning those highly-rated districts, leaving them in an even worse plight. The burden of rates upon industry was cumulative. The product of the coal industry, already rated, was converted into coke and rated again. Then with rated iron ore and limestone, it was used to produce pig iron, and the industry was rated. Into the conversion of the pig iron into steel, more rates entered, and he was informed that the average burden of rates upon steel was 4s. a ton. The railways, although sheltered from foreign competition, had to contend with active road transport competition, which seriously reduced their revenue from a number of sources. The coal and iron industries had no alternative means of transport, and the railways were compelled to pass on a great deal of their burden (including £7,000,000 a year in rates) to those industries. Thus, the price of pig iron was further increased. The Balfour Committee had reported that in typical cases the total rail charges entering into the cost of pig iron in 1925, was 23s. 5d. a ton, or 29 per cent. of the total market price.

The Chancellor thus showed the need in which the basic industries stood of some sort of relief. He was careful to impress upon the House, however, that that relief would not be a panacea; rather would it be in the nature of a stimulant to enable them to make further efforts themselves to reach prosperity. The Government intended to proceed in three stages. First, it would raise the necessary money to afford relief to producers; then it would define the nature and extent of relief; and thirdly, consider means for reimbursing local authorities for the loss of revenue. The surplus from last year, and the prospective surplus upon this year's Budget, together amounting to 9¾ millions, would be "earmarked" for the purpose, but would be inadequate. He proposed to raise the balance by a duty on certain kinds of imported light oils. This announcement was led up to by a consideration of the respective positions of rail and road transport. In short, Mr. Churchill pointed out that while road transport was increasingly diverting traffic from the railways and wearing out the roads, it was not paying its fair share of the cost of construction and maintenance of those roads. Enormous sums were being spent in that direction by local authorities, and still larger amounts would have to be forthcoming, as the traffic became heavier and heavier. The proposed duty of 4d. per gallon on light oils (including petrol), would permit of the distribution of the local authorities' burden more sensibly and more justly. Heavy fuel oils would not be affected, for any restriction of their use would cause economic disturbance out of all proportion to the revenue involved; and home-produced oils would be exempt. The duty was to be imposed immediately.

As regarded the scope of relief, Mr. Churchill said that the case of public utility undertakings (such as gas, electricity and water), had been considered at length, but it was finally decided to exclude them from the scheme. The object of the Valuation Ascertainment Bill, which would be introduced immediately after the Budget resolutions, was to separate one class of property from another, and define productive property for the purposes of relief. That relief would be granted to properties comprising every form of production, from the heaviest trades to the most complicated, and from the most prosperous to the most depressed. It would also be enjoyed by freight-carrying railways, canals, harbours and docks. In the aggregate the undertakings covered provided the means of livelihood for more than 10,000,000 wage-earners. It was proposed at the rating payment of October, 1929, to reduce the local rates upon those undertakings by three-quarters; in the case of the agricultural industry, which already had relief, the whole of the rates would be remitted.

Steps were being taken to prevent the relief which the railways would secure (about four millions a year) from being spread over the whole of their traffic. One-fifth of that relief would be given to agriculture, and the other four-fifths to the heavy industries comprising coal, coke, patent fuel, mining, timber, iron-stone, iron ore and manganese ore, limestone for blast furnaces and steelworks. Those industries were selected principally because they either played a vital part in export trade, or lay at the very foundation of our national well-being. He was informed that the ultimate result

should be a reduction of 8 per cent. in transport costs which, with the direct rating relief, should be a valuable aid to the competitive power of those industries. Their restoration to prosperity would permeate the whole of our social and economic life, and would return to us from abroad in the form of an improved trade balance.

The Poor Law reform part of the proposals subsisted in the broadening of the areas. The Chancellor indicated that it was the Government's intention to introduce a Local Government Bill in the winter, to provide that county councils should take over the administration of poor relief and highways. The finance of the whole scheme was dealt with in a concise manner. It was estimated that the de-rating of agriculture would cost £4,750,000 a year, the relief to the heavy industries, railways, &c., over £21,000,000, and the inauguration of the new scheme of local government, £3,000,000. Thus, the Exchequer had to find £29,000,000 a year, and it was necessary to accumulate a surplus to tide over the period until the new duty upon oils grew sufficiently to cover the amount; that was why the duty was to operate at once, although relief would not commence until October next year.

Mr. Churchill concluded his speech with a little light relief by announcing his intention of increasing the allowances for children, for the purposes of income tax.

In the course of his speech at the annual meeting of the Federation of British Industries last week, the retiring president, Lord Gainford, congratulated Mr. Churchill upon his Budget. He said that his proposals for local rating reform constituted the first recognition by a Chancellor of the Exchequer, in his Budget, of the fact that industry was the most important element in the country. They welcomed wholeheartedly the aim of the Government to give direct relief to producers, and to necessitous areas, and they trusted that the relief given to the railway companies might give an additional fillip to our depressed basic trades by ensuring the reduction of local rates. It had to be recognised, however, that the schemes merely shifted the burden, and did not reduce it, and it must still be the aim of any Government to reduce the total burden which taxation laid upon the shoulders of the nation.

In a statement to the Press, Mr. D. N. Dunlop, director of the British Electrical and Allied Manufacturers' Association, welcomed the Chancellor's proposals for the relief of industry, and said that the electrical industry would benefit in three ways: through the actual relief of the rates; through reductions in the cost of materials; and through the greater activity of industry generally. Local taxation was not a matter of great importance in the actual costs of production, the total sum due on that account being less than one per cent. of the output of the industry. As a finishing industry, however, it would benefit from the cumulative effects of the relief upon the cost of its materials, which would improve its competitive power, and allow it to develop a more aggressive export policy.

The Revised Overhead Line Regulations.

The Author reviews the new Overhead Line Regulations and the accompanying Memorandum of the Electricity Commissioners.

By W. FENNELL, M.I.E.E.

IT is fitting that the ELECTRICAL REVIEW should contain a review of the new Overhead Line Regulations, to inform its readers of what has been accomplished, and to indicate what still remains to be done in order that electricity may be made available to rural dwellers.

On reading the draft of the Regulations (El.C.53)* nearly two months ago, the writer felt disappointed that so little had resulted from so much effort. The summary of the proposals of the Overhead Lines Association had appeared in the Press; many points were dealt with by them to which there was no adequate response in the draft. Probably the draft was produced before the Overhead Lines Association's representations reached the Commissioners, but the Commissioners, with almost feminine tact, have now produced an important postscript, in the form of a Memorandum (El.C.53A), equalling the regulations in bulk and importance. This takes into account the O.L.A. representations and alters the whole effect of the Regulations in their bearing upon the cost of overhead work.

The suggestion that special relaxations should be given for secondary and distribution lines has not been adopted, and the new Regulations apply equally to heavy main transmission lines and to branch circuits. The new Regulations approach the minimum allowable standard applicable to an industrial district, such as Lancashire, the N.E. Coast, South Staffordshire, and South Wales, to take examples, where populations are fairly dense and where in some cases atmospheric conditions are apt to cause corrosion. There is still room for the French policy of grading the Regulations, and making further concessions to enable a supply to be given in thinly populated agricultural areas.

* H.M. Stationery Office, price 2d. net.

The following is a summary of what has been conceded, compared with what we wished to get:—

Regulations 1 and 2: Line Material.—There is no change. It was desired that the Commissioners should cease to limit authorised materials to copper and aluminium, and admit (formally) those conductors, such as steel, steel-cored aluminium, cadmium copper, &c., which the Commissioners in the Memorandum now indicate have been approved in specific cases. There is little doubt of their approval being given on application, but special approval takes time. The sanctioning of quite ordinary overhead work already involves far too much delay. Further, one cannot order special material until the sanction actually comes through, lest it should be rejected. It may still be hoped that the Commissioners will extend their list.

Regulation 3: Size of Conductors.—The minimum size of conductor has been increased from No. 11 S.W.G. (approx.) to No. 8 for lines and No. 10 for services, but all good overhead-line engineers had ceased to use anything less than these larger sizes years ago, and would like to see the same wise rule applied to the Post Office, which would then be deprived of its "flying wire" argument, to the relief of electricity undertakers and the telephone users who suffer with every gale.

Regulation 4: Inaccessibility of Lines.—This remains unaltered and obscure. The clearing-up of this as suggested by the O.L.A. would have been helpful.

Regulation 5: Proximity to other Lines.—There is no change. It is still open to the Post Office—or indeed to any person—to fix a line, as second comer, in dangerous proximity to an existing power line and require the electricity undertakers to spend many pounds to cope with the second comer's negligence or wilfulness. This regulation is probably contrary to the common law of Eng-

land, and would not be in force but for the power of the Post Office.

Regulation 6: Supports.—The suggested permission to use wood other than creosoted red fir is given tentatively in the Memorandum, and those wishing to use local timber, and having time to spare, may apply for permission.

Regulation 7: Factors of Safety of Supports.—There is no change, but an inquiry is being made as to ferro-concrete, the only material for which any reduction was desired. It is to be hoped that this inquiry will result in reduction of the factor of safety to that for steel as advocated so ably by Major T. Rich. The Commissioners' statement, in their Memorandum, that the Regulation *now* calls for absence of movement of poles in the ground, overlooks the fact that the old Regulations also required poles to withstand the maximum stress without movement. Their suggestion that the risk of movement is increased under the new Regulations requires elucidation. The assumed ice loading has been diminished and the poles will be shorter; moreover, the factor of safety of poles in unchanged. It appears at first sight, therefore, that while the longitudinal stress is increased by tighter stringing, the only change of pole stress will be on section poles, which are always well stayed. The longitudinal stress capacity for intermediate poles is required to be only one-fourth of the transverse stress under both the old and new codes, and there is a very considerable margin. However, the question of ground stress has not received sufficient attention, and more consideration of this subject is indicated.

Regulation 8: Service Line Protection.—There is no change, but the Memorandum clears up the doubt which existed, in the way suggested by the O.L.A., by indicating a zone of 6 ft. from a building for insulation of service wires.

Regulation 9: Double-Circuit Poles.—The old regulation which allowed this has been restricted by the addition of a requirement that the method to be adopted for keeping high-pressure circuits from injuring linesmen, and from endangering the low-pressure system, shall be approved by the Commissioners. The writer has found the use of double-circuit poles to be very advantageous for hamlets on the line of route of h.p. country lines, and it has enabled a supply to be given to scattered houses *en route*, where a separate line would have been out of the question. The writer voluntarily submitted his method of protection to the Commissioners, and no objection was raised, so that the Commissioners' sanction should be relied upon for satisfactory proposals.

Specific Regulations.—The new regulations themselves reduce the ice loading for conductors up to 650 V, d.c., and 325 V, a.c., from ¼ in. radial to 3/16 in., and for higher presures from ½ in. radial to ⅜ in., without increasing the wind pressure. These reductions are substantial, especially for the higher pressures. It was proposed by the O.L.A. that the ice loading should be ¼ in. radial, for both high and low pressure, as that had proved satisfactory, and it would have facilitated rural h.p. work and assisted standardisation. The other concession is the reduction of calculated minimum height at 122 deg. F. from 20 ft., everywhere to 19 ft. across public roads, and 17 ft. in other positions, reduced to 15 ft. " in situations inaccessible to vehicular traffic." The exact amount of reduced cost will depend upon the route, and upon the interpretation of " inaccessible to vehicular traffic." It is sufficient to state now that these are very important concessions.

Precautions to Prevent Danger.—These remain unaltered in the Regulations, and as regards " low "-pressure work, one had the feeling that all the old bad guards and gadgets were to remain. The Memorandum however, sweeps away the guards by accepting an unguarded vertical formation, provided the earthed conductor is placed in the lowest position, and a staggered earthed conductor, *i.e.*, one connected on the opposite sides of alternate poles, is considered to be adequate protection, even where the live conductors are not in vertical formation. The postscript here is more important than the Regulation. We can all make use of this concession, even on existing lines, by taking advantage of the reduced heights to bring our wires one above the other, and remove the V guards, &c.

Post Office:—One concession, and that of doubtful value, has been obtained from the Post Office. It will accept an *earthed* wire over the power wire where the latter is under the Post-Office line; this applies apparently to lower pressures only. P.B.J., already allowed up to 250 V to earth, a.c., will be cheaper and more convenient in most cases, as the cost of earth plates is rather heavy. The concession of a clearance of 2 ft. instead of 4 ft., which has been obtained from the Post Office for lower pressures, will avoid some correspondence, but it had already been conceded in difficult cases on application. No concessions are indicated for high-pressure crossings, so that rural work is still crippled by the Post Office.

Pole Metal Work.—The unsatisfactory and dangerous " bonding without earthing " of pole metal work still remains, and it is to be regretted that the Commissioners have not made more inquiry into this before coming to a decision, as it would probably have resulted in the removal of this defect.

Voltage Variation:—An increase in the permissable voltage variation limit from 4 per cent. to 8 per cent. has been conceded in necessitous cases, pending interconnection of rural distributing networks. The writer has advocated this so strongly in the past, that he is naturally very pleased to see it, the only concession given for rural work, as such.

Procedure.—There are notes on procedure giving apparently a still further privilege to the Post Office by suggesting that we arrange our routes, over which it really has no legal control, in consultation with it. It is not suggested that any corresponding promise has been given, that the Post Office will consult us with reference to its " second-comer " routes. The writer has himself received this promise, but it has not been carried out, so far; and he has never found a sectional engineer who will admit knowledge of the routes of future proposed lines for development.

A form of notice to local authorities and a new form for filling in details of proposals are sent—to the joy (?) of office staffs! We have a really valuable concession in that we need not buy in future, hundreds of 6-in. Ordnance sheets for submission of line routes, but may trace or print from our own copies. The writer cannot imagine what " Winston " was doing to allow this loss of official income, unless he proposes to tax photo print paper in his next budget.

It is recognised by the writer that one cannot expect authority to concede all or even most of what is asked of it—all at once—we hasten slowly in Old England. He does feel that the Commissioners have listened to our representations with sympathy, and have gone a long way towards providing the relaxations necessary for a rapid extension of electricity supply by means of overhead lines. We now have a basis upon which engineers can recommend their committees and boards to supply the more accessible villages. Later, when further consideration is given to the remaining points, the general electrification of the agricultural country can proceed.

Among the points still requiring attention is the proposal to allow the return or neutral conductor of h.p. circuits to be earthed 4 times to the mile, so saving the cost of a separate earth wire. Apart from Regulations we have the serious difficulties as to wayleaves, including the unreasonable toll levied by railway companies and the Post Office requirements, which have not been relaxed for high-pressure work.

We can, however, thank the Commissioners sincerely for the substantial concessions they have given in the new Regulations, and particularly by the Memorandum, which breathes a spirit of elasticity and, one may say, of trust. We can prove to them, by a policy of scrupulous care in carrying out the spirit of the concessions, without forcing them unduly, that overhead-line engineers are worthy of the trust being placed in them.

The Future Wireless Receiver.

German wireless traders examine the position and state their conclusions relative to the demand for various classes of instrument.

By A. J. S.

ONE of the advantages of regular trade exhibitions is the opportunity they present for taking a general survey of the whole industry, and in this respect the Spring Fair at Leipzig was of considerably more importance than usual to the wireless trade. Although the wireless section of this show is not on the same scale as the exhibition which is held in the autumn in Berlin, it was this year very well supported, and the German Wireless Traders' Association held its annual meeting there. On this occasion there was compiled for the use of the Association, and published in the official organ of the *Reichsverbandes Deutscher Funkhändler*, a detailed survey of the present-day position with regard to receiving sets and an estimate of the probable trend in the future. The results of this examination were set out in the form of a table, of which a translation is reproduced below, and it will have a certain interest for the trade in this country as showing the way in which the wireless trade on the Continent is developing. Present-day German sets are classified in ten broad groups.

SURVEY OF RECEIVER POSITION AT LEIPZIG SPRING FAIR, 1928.

No.	Circuit.	Coils.	Valves.	Equipment.	End Amplification.	Suitability for Battery Elim.	Present Position.	Probable Future Position.	Price.
1	Dar L	P	2 (or 1 multiple)	U	L	Yes	E	With elim. O	20/-+v.
2	Da Rc L	P	3 (or 1 multiple)	U	L	A	EE	E	39/6
3	Dr Rc L	P	3	U	L/P	A	OO	O	24/- + 15/6
4	Dar Rc L	B 2,000	3	B/Hc	P	A	O	O	70/- to 80/- +v.
5	Dar LL	Sht. wave	3	B	P	Yes	O	OO	£5+v.
6	H Dr Rc L	P	4 (or 2 multiple)	U	L	A	O	E	£8-5+v.
7	H Dr LL	B 2,000	4	B	P	Yes	O	OO	£9+v.
8	Neutro 5	B 2,000	5	B/Hc	P	Yes	O to E	O	£12-10+v.
9	Super 7-8	B 2 000	7-8	B/Hc	P/G	Yes	O to E	OO	£22- 0+v.
10	Mains 3	B 2,000	3	Hc	P	Existent	O	OO	upwards £20

CIRCUIT:
- D Detector.
- DR Detector with reaction.
- DAR Detector with reaction and aperiodic aerial.
- RC Resistance-capacity coupling.
- L Low-frequency stage.
- H High-frequency stage.

COILS:
- P Loose plug-in coils.
- B Built-in coils.
- B 2,000 ditto, up to 2,000 metres.

VALVES:
- Extra.

EQUIPMENT:
- U Usual coils and plugs projecting from cabinet.
- B Boxed-in coils and valves, enclosed in cabinet.
- HC Specially high-class cabinet.
- C Console type of cabinet.

AMPLIFICATION:
- L Usual l.f. valve, 0.05 watt.
- P Loud-speaker valve, 0.1 watt.
- G Special counter-action loud-speaker valve, 1 watt.

BATTERY ELIMINATION (anode):
- A With suitable alteration.
- Yes Without alteration.

PROSPECTS:
- O In demand, orders.
- E Inquiries and interest, but not ordered to same extent.

TYPE No. 1 was formerly very good apparatus to handle in Germany, and at the present time it might very usefully be redesigned with a form of battery eliminator, with very good prospects of success.

TYPE No. 2, which class is typified by such instruments as the Telefunken "Arcolette I" and the Loewe sets for local-station reception, is not considered to have any future.

TYPE No. 3 made an important showing at the exhibition in the shape of a 24s. receiver which can be sold complete with valves for 39s. 6d. The type was shown by half a dozen firms, the models made by Ideal, Fernfunk, and Owins being typical. It is slightly better value than Type No. 2, and it is believed that this instrument meets a distinct want, not only in Germany, but in many other markets as well.

TYPE No. 4 is very similar to the preceding class, and is represented by such receivers as the "Arcolette III" (Telefunken) or the *Volksempfänger* popular sets of such firms as Siebt and Lorenz, but nearly all manufacturers now list such a type. It has the drawback that it is about double the price of the preceding model, but its general appearance, with built-in coils and valves, makes it much more presentable when viewed merely as an article of furniture for a room. Most makers favour a final power loud-speaker valve of first-class make. It is expected that in one or two years, types 2 and 3 will have definitely disappeared.

TYPE No. 5 is for short-wave reception, and in general construction resembles commercial short-wave receivers, such as are built by the older wireless firms for marine and aircraft work. These sets were one of the novelties of the Spring Exhibition, and the Saba model might be taken as a typical example. It is expected that instruments of this type will soon be an essential part of the stock of the up-to-date trader.

TYPE No. 6 is a group that includes sets of the Suchardt 4-valve type and similar instruments. Even in this class, plug-in coils are used and, with the exception that it has an additional h.f. stage, it can be compared with group 3. This is the cheapest class of 4-valve instrument yet produced for general European reception.

TYPE No. 7 resembles the preceding class, but the instruments are better arranged, and sometimes have a built-in loud-speaker. A good example of the type is the Siemens 4-valve set with Protos loud-speaker, but many other firms are also manufacturing a similar type. When a modern power valve is used, this class is suitable for very high-quality reception.

TYPE No. 8, under which heading is grouped the well-known neutrodyne with five valves, represents the German standard high-class long-distance receiver, and it is considered that in a few years this class of apparatus will dominate the market so far as sales are concerned; it is now produced by all the best instrument makers.

TYPE No. 9 is a group in which are classed the most expensive sets of all, some of which, such as the Berliner, are in expensive console cabinets, and arranged for direct mains operation. In the large towns there is expected to be an important demand for these sets. The firm of Lorenz showed such an instrument arranged as a 6-valve portable outfit with a built-in loud-speaker, which is welcomed as the first really practical German portable set.

TYPE No. 10 is the latest 3-valve electrically operated set used without batteries. In the future, a loud-speaker will probably also be included. The A.E.G., Telefunken, and Vogt firms have all placed such sets on the market, designed to appeal especially to novices.

In the foregoing summary is set forth the general trade view of the position in Germany and those Continental countries whose wireless demand follows closely

the German lead. A summary upon somewhat similar lines, if compiled by the organised trade in this country, would not be without its value. There are many manufacturers who have produced what they believe to be a really first-class type of instrument, but are not altogether satisfied with the volume of trade which has resulted, who are asking what is to be considered the most popular set of the future. Wireless traders, by reason of their position in direct contact with the general buying public, should be able to give a valuable lead in the matter. One very well-known firm of British manufacturers, it is understood, is at the present time engaged in a systematic canvass of its agents all over the country for views upon what is needed, with the intention of producing for next season exactly the class of set which the majority of its agents specify. Up to the present, the average manufacturer has been without a definite lead from the distributing branch of the trade, and, although one may occasionally encounter individual opinions, such as the view recently expressed in an advertising journal that "a good-quality receiver, selling at a moderate price, manufactured in really big quantities, and well advertised, would sweep the country," something is needed more than generalities, and this need the wireless traders in Germany have set themselves in some measure to supply.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Export Credits Scheme.

In view of the great increase in the volume of business which the Export Credits Guarantee Department is insuring for Lancashire exporters, Mr. Douglas Hacking, the Secretary of the Department of Overseas Trade, has appointed Mr. S. Judson as local representative of the Department in Manchester. The Manchester Chamber of Commerce has very kindly agreed to make available for the Department's representative temporary accommodation, in the offices of the Chamber, and Mr. Judson took up his duties in Manchester on May 1st.

Russian High-voltage Insulator Manufacture.

Since the beginning of the current economic year the General Electrical Trust has completely suspended the manufacture of low-voltage (telephonic and telegraphic) insulators at its works, and has specialised in the manufacture of high-voltage insulators, which until recently had to be imported. During the economic year 1927-28 it is planned to turn out 787,000 insulators, the manufacture being concentrated at the Isoliator works at Moscow, the Artema works at Slaviansk and the Proletarii works at Leningrad. The manufacture has been begun this year of suspension insulators for use in transmission lines. Their quality is said to be equal to that of imported insulators; before leaving the works they are subjected to a special 300,000-V test. Owing to measures of improvement which have been adopted it is hoped to reduce the cost of production this year by from 15 to 20 per cent.—*Reuter's Trade Service* (Moscow).

The Cash-on-Delivery Service.

On Monday last the Post Office cash-on-delivery service was extended to letter packets and goods sent by rail. The already-existing rates are to apply, but the value of goods sent under the system is not to exceed £40.

Changing-over and Income Tax.

In connection with the representations made by the Glasgow Corporation Electricity Committee to the Inland Revenue as to the income-tax allowance on the costs of changing over consumers' installations from direct current to alternating current, the Board of Inland Revenue has decided: (*a*) that expenditure on alteration or substitution of consumers' plant or fittings consequent upon change in the type of current supplied is not an admissible deduction in computing profit for the purpose of income tax; and (*b*) to raise no objection to an allowance being made in respect of generating plant, &c., discarded at various stations at which generation has been discontinued and replaced by similar plant at Dalmarnock. H.M. Inspector, Glasgow District, referring to the above communication, asks the Corporation to undertake in writing to bring into taxable profit any sum ultimately realised from the disused cables left in the ground, now treated as being valueless. The Committee is to consider the letters.—*Financial Times.*

The B.I.F. Catalogue.

The Department of Overseas Trade announces that a limited number of copies of the catalogue of the London Section of this year's British Industries Fair are available at 1s. each, post free. The catalogue forms a useful work of reference and buyers' guide.

Works Visit.

Members of the Walsall Engineering Society visited the works of Messrs. George Ellison, Perry Barr, Birmingham, recently, and spent an interesting time in the works, where they were shown most of the firm's products, including emergency switchgear, which was demonstrated. They were afterwards entertained to tea in the Welfare Department, where a vote of thanks to the firm was proposed by Mr. Lavender, and seconded by Mr. Doran, both of whom mentioned particularly the name of Mr. H. C. Price, the manager of the works, by whom the party was conducted.

Hiring Scheme at Fulham.

The Fulham Borough Council has recently instituted a scheme for the renting of electrical installations and appliances. In connection with this, Mr. N. A. Chesterfield, Commercial Superintendent, has prepared a booklet dealing with the appliances which are available, charges, and a number of other electrical matters. The booklet is profusely illustrated and should stimulate domestic electrical business in the borough.

Local Exhibitions.

KING'S LYNN.—In our last issue we made reference to the electrical exhibition at King's Lynn during last week. We reproduce herewith a photograph of the display showing the

The King's Lynn Exhibition.

Corporation's display, which prominently announces co-operation with local contractors. The Mayor and Mayoress of the town are seen in the picture; the latter opened the exhibition.

SMETHWICK.—The latest of the exhibitions arranged by the Shropshire, Worcestershire and Staffordshire Electric Power Co. is being held this week at Empire House, Smethwick. It was opened on Wednesday by Mr. W. E. Lawrence, J.P., president of the local Trades and Labour Council, and closes to-morrow (Saturday). There are daily demonstrations of cooking and labour-saving devices, and a number of local contractors are assisting.

The West Midlands J.I.C.

We have received the annual report of the District Industrial Council for the Electricity Supply Industry No. 5 (West Midlands Area). Reference is made to the stabilisation in December last of wages of employés in the industry for the whole of the current year. It is stated that the number of men employed by the undertakings represented on the Council is 2,900, in addition to which there are 250 boys and youths. The question of the rates of wages paid to men employed in laying mains and services has been investigated, but so far no agreement has been reached regarding an increase in wages for this class of labour. The eight years' experience of the Council has shown that practically all differences between employers and employed in the industry are capable of adjustment and equitable settlement after frank discussion and with goodwill on both sides. The Council expresses its regret at the retirement of Mr. E. J. Jennings from the post of hon. secretary and treasurer. It is stated that Mr. Jennings has been succeeded by Mr. C. Heathcock, F.C.I.S., 27, Temple Street, Birmingham.

Trade Announcements.

The Société pour l'Equipement Electrique des Véhicules (S.E.V.), of Issy, Paris, has appointed W. D. FOSTER & Co., 26, Hampstead Road, N.W., sole agents and repairers for the S.E.V. electrical equipment for motor vehicles in this country.

Messrs. SKINNER & BURTON-SHAW, electrical contractors, have removed from their Draper Street Works to new showrooms at 76, London Road, Southborough.

Messrs. GARDNER & TOWERS, electrical engineers, have opened new premises at 16a, Market Street, Rugby.

New Catalogues and Lists.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—Leaflet 246, illustrating and briefly describing the "Brookhirst" control gear installed in the T.S.S. *Op ten Noort*.

MESSRS. GRAHAM AMPLION, LTD., 25, Savile Row, W.1.—A pocket containing a number of illustrated and priced publications, including instructions for building an "Amplion" cone amplifier, and details of the company's "Vivavox" gramophone pick-up, loud-speakers, &c.

BRITISH INSULATED CABLES, LTD., Prescot, Lancashire.—Publications Nos. P.233 and P.234, dealing respectively with "Prescot" lead joint boxes, and compounds for boxes and joints. Illustrated.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Descriptive List No. 653, dealing with electric printing press equipment. The brochure is well illustrated, and describes in some detail the installation and operation of motors applied to various types of machines, their control gear, &c.

ENTERPRISE MANUFACTURING CO., LTD., Grape Street, London, W.C.2.—12-page list announcing reduced prices of numerous electrical accessories.

MESSRS. W. J. FURSE & CO., LTD., Traffic Street, Nottingham.—Two illustrated booklets, one describing some of the company's work in electrically equipping greyhound racing tracks, and the other relating to contracts carried out by them for the electrical installation and equipment of beet sugar factories.

CANADIAN PORCELAIN CO. (BRITISH), LTD., 4, Victoria Street, London, S.W.—52-page catalogue illustrating and giving brief particulars of various types of insulators, suspension clamps, strain yokes, &c., for overhead work, with weights, codewords, &c.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, London, S.W.1.—List 43 (16 pages), containing illustrated and priced particulars of various types of their time switches for shop-window lighting, signs, &c.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—Two illustrated and priced leaflets dealing respectively with a range of electric kettles fitted with a re-setting safety device, and the "Atom" electric fire.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 190, dealing with "Benjamin" reflector fittings for all applications. Fully illustrated and priced.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—Two illustrated and priced pamphlets describing the company's trickle charger for feeding accumulators from a.c. mains.

Bankruptcy Proceedings.

EDWIN SHAW, electrician, 11, Albion Street, Huddersfield, Yorkshire.—The public examination of this debtor was held recently at the County Court House, Queen Street, Huddersfield. The gross liabilities were £208, of which £194 was expected to rank, against assets estimated to realise £32, leaving a deficiency of £162. In April, 1921, the debtor commenced trading from his home address on his own account. He later took a workshop in Charles Street, and afterwards removed to Albion Street. Most of his work had been contract work for installation of electric light at mills, business premises, and private houses. His banking account had been overdrawn since March, and his withdrawals had exceeded the profits. The examination was closed.

W. S. PETHERBRIDGE, electrical engineer, 32, Manchester Road, Reading.—The public examination of this debtor was adjourned at the Assize Courts, Reading, recently. The statement of affairs disclosed liabilities of £152, against assets of £47, leaving a deficiency of £105. Debtor attributed his failure to shortness of capital, slackness of trade, and insufficient profits.

O. L. JONES, Llangennech, Carmarthen, lately trading as Jones & Evans, wireless dealer, Pontardulais, Glamorgan.—The receiving order herein was made recently on the debtor's own petition. The first meeting of creditors was held on April 24th at the Official Receiver's office, 4, Queen Street, Carmarthen. The following are creditors:—

	£		£
Naylor Bros.	33	Pragnell, Oliver & Co. ...	20
Mander Bros.	41	Decorators Supply Co. ...	24
Matthews, Hy., & Co. ...	30		

E. E. MEARNS, electrical contractor, 14, St. Bede's Road, East Boldon.—Discharge suspended until a dividend of not less than 7s. 6d. in the £ has been paid to the creditors, with liberty to the bankrupt at any time after the expiration of two years from the date of the order to apply for a modification thereof.

W. H. DICKSON and A. J. SOLOMON (Dickson & Solomon), electrical and wireless engineers, 13 and 14, Tavistock Street, Devonport.—First and final dividend of 1s. 11½d. in the £, payable May 12th, at the Official Receiver's office, 11, St. Aubyn Street, Devonport.

A. F. KINGDOM, electrical and mechanical engineer, 86, Old Town Street, Plymouth.—First and final dividend of 4s. 4½d. in the £, payable May 12th, at the Official Receiver's office, 11, St. Aubyn Street, Devonport.

P. W. PENTY (Sackville Electrical Co.), electrical contractor, 38, Mannville Terrace, Morley Street, Bradford.—Receiving order made April 19th, on debtor's own petition.

F. A. HARTLEY and R. HARTLEY (F. A. Hartley & Son), electrical engineers, 98, Katherine Street, Ashton-under-Lyne.—Bankrupts' discharge suspended for 12 months, until March 30th, 1929.

R. G. ROBERTS, electrical engineer, Magnet House, College Road, Upper Bangor.—Last day for proofs for dividend May 12th. Trustee, Mr. I. D. Hooson, Official Receiver, St. Peter's Churchyard, The Cross, Chester.

Company Liquidations.

MIDLAND MANUFACTURING CO. (1922), LTD.—A petition for the winding up of this company has been presented to the County Court of York, held at Sheffield by the Magnolia Anti-Friction Metal Co. of Great Britain, Ltd., of 49, Queen Victoria Street, E.C., creditors, and will be heard at the County Court Hall, Sheffield, on May 10th.

ACOCKS GREEN ELECTRICAL STORES, LTD.—Winding up voluntarily. Liquidator, Mr. F. E. Bendall, Midland Chambers, Warwick Place, Corporation Street, Birmingham.—A meeting of creditors is called for May 10th, at the liquidator's offices. Particulars of claims by May 31st.

RADIAX, LTD.—A meeting of creditors was held at Winchester House, Old Broad Street, on May 3rd.

HESWALL ELECTRIC LIGHT CO., LTD.—Winding up voluntarily. Liquidator, Mr. L. Bailey, 8, Harrington Street, Liverpool. A meeting of members was called for May 2nd, at the liquidator's offices. Particulars of claims to the liquidator by May 7th.

UNEEDA MAGNETO CO. (LEEDS), LTD.—Winding up voluntarily. Joint liquidators, Mr. V. Walton, 26 & 27, Bond Street, Leeds, and Mr. H. Alexander, City Chambers, Leeds. A meeting of creditors was called for May 3rd, at the Law Institute, Albion Place, Leeds. Particulars of claims to the liquidators by June 20th.

ENDOLITHIC MANUFACTURING CO., LTD.—A meeting of creditors is called for May 7th, at the offices of Messrs. Wilde, Ferguson-Davie & Miller, 61½, Fore Street, E.C. (This notice is purely formal, as all debts have been paid or satisfied, or payment provided for in full.)

Dissolution of Partnership.

DELL & HUGGINS, wireless engineers, 60, Rosemary Road and 52, Pier Avenue, Clacton-on-Sea.—Mr. A. L. Dell and Mr. A. E. Huggins have dissolved partnership.

Private Arrangements.

HENRY ERNEST BRUTON, trading as the Bruton Wireless and Electrical Co., Chapel Lane, Fishponds, Bristol.—Meeting of creditors held on April 20th. Mr. F. E. Webber, I.A., Bristol, reported that the liabilities were £536, of which £279 was due to the trade and £257 to cash creditors. After allowing £42 for preferential claims, the net assets were £103, leaving a deficiency of £433. Debtor served an apprenticeship to the electrical trade, but in August, 1927, he started trading as a grocer and hardware dealer. Last December he disposed of his stock, and started a wireless and electrical business. He had little or no capital of his own, but borrowed £45. The bank were creditors for £113, but they held a third party guarantee. Debtor had been losing money ever since he started the business. The deficiency was accounted for by loss on trading and depreciation written off the assets. An offer of a composition of 3s. 6d. in the £, payable in cash, was accepted.

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An E.D.A. Refrigeration Campaign.

The British Electrical Development Association is organising a propaganda campaign on behalf of British electrical refrigerators. It will commence on June 8th, and continue until June 25th. The principal features of the campaign are as follows: The Association will organise, through its Circles, a series of luncheons on the lines of those organised in connection with the E.D.A. Circle Campaign. In this way a considerable amount of gratuitous publicity can be obtained for the Campaign in the Press of the whole country. The Association is preparing a handsome window display, a little larger than the one used in connection with the National Electric Week. A large number of these displays will be provided, free of charge, to supply undertakings and contractors who will guarantee to exhibit them during the whole period of the Campaign. A series of advertisements is being prepared, and free stereos will be provided to electrical advertisers who are prepared to use them in local advertising. The Association will prepare special form letters for circulation to householders, restaurants, dairies, butchers, &c. Efforts will be made to encourage the preparation of special mailing lists for the circulation of these form letters. In addition, special refrigeration literature is being prepared.

New French Company.

A company has been formed in Bordeaux with a capital of 500,000 fr. and the title La Société Union Hydro-Electriques Africains, to develop the water power resources of French East Africa.

The Marking of Imported Lamps.

It will be remembered that in February the Standing Committee of the Board of Trade, under the Merchandise Marks Act, 1926, held an inquiry into an application by the Electric Lamp Manufacturers' Association for an Order-in-Council requiring the marking of imported incandescent electric lamps (ELEC. REV., February 10th and 17th). The report of the Committee has now been published (Stationery Office, Cmd. 3083, 2d. net). After a review of the evidence, the Committee has decided that there is a substantial possibility of a purchaser being unaware of the origin of unmarked lamps, and accordingly there is a case for the making of an Order-in-Council, which should require that lamps should be marked upon importation. The Committee says that it is not impressed by the objection of the opponents (Philips and Tungsram) that a Marking Order which did not extend to parts would encourage the importation of parts for assembly in this country. In any event it remains open for interested persons to apply for an Order for the marking of parts. It is accordingly recommended that incandescent electric lamps, except small types grouped under the generic term of "flash-lamps," should be required to bear an indelible indication of origin in a conspicuous manner on the bulb and also on any carton, wrapper or other container in which they may be imported, sold or exposed for sale. The Committee considers that in the case of flash lamps it will be sufficient if the carton or other container is marked. To avoid any confusion, wireless valves and mercury-vapour arc lamps should be specifically excluded from the Order. Exemption should be provided in the case of lamps imported with, and forming part of, other goods, *e.g.*, lamps on a motor car, or lamps imported in electric torches. It is recommended that the Order should come into force six months after the date on which it is made.

Wages in the Engineering Industry.

The trade unions connected with the engineering industry recently made application for an advance of 8s. per week in the wages of time workers, with corresponding additions to piece-work rates. Last week the Engineering and Allied Employers' Federation announced its inability to accede to the request. Sir Allan Smith, on behalf of the Federation, said that the decision was due to the heavy burdens which the industry still had to bear, particularly in connection with local rates. The result of these burdens had been the loss of orders to foreign firms which had worsened the position of the industry and rendered impossible the granting of any increase in wages.

British Electrical Plant for Hungary.

The Budapest correspondent of *The Times* reports that the Hungarian Minister of Commerce made a statement last week with regard to the Power and Traction Finance Company's scheme for a big plant at Banhida to provide power for the electrification of the Hungarian section of the Budapest-Vienna railway line. He said that the construction of the great electric power plant had begun, as the negotiations for the loan had ended and the bonds were to be issued before May 15th. The Minister said that £3,000,000 would be paid out at once, and that, in connection with the construction of the works, Hungarian industry would receive orders amounting to about £2,000,000, and the British industry orders amounting to about £1,000,000. Between 42 and 48 per cent. of the machinery was to be delivered by British factories, while the rest would be made in Hungary.

Malayan Electrical Imports.

During 1927 imports into Malaya of electrical goods and apparatus totalled £635,101, as compared with £498,289 in 1926.

Recent Contracts.

The ENGLISH ELECTRIC CO., LTD., has secured two important contracts placed respectively by the West Ham and Leicester Corporations. What is claimed to be the largest steam turbine-driven electric generator set of its kind in this country and probably in the world, is to be constructed to the specification of Mr. F. W. Purse, chief electrical engineer of West Ham. The set will run at 3,000 r.p.m. and develop 30,000 kW, and it will have a single alternator. The contract placed by the Leicester Corporation is for a 25,000-kW steam turbine and alternator which will resemble the West Ham set in being of the 3,000-r.p.m. multi-cylinder type; this set will be built to the specification of Mr. J. Mould, the chief engineer of the Leicester Electricity Department. Condensing plant is included in both cases, and at Leicester switchgear is also included. The total value of the two contracts is about £200,000. At the meeting of the Leicester City Council at which the tender was accepted, it was stated that the offer was only 3¼ per cent. higher than that of a Swiss firm. Eighteen months ago the Council had accepted a Swiss offer because the lowest British tender was 87 per cent. higher.

The ELECTRIC FURNACE CO., LTD., 17, Victoria Street, S.W.1, reports that it has recently obtained a contract to supply an "Ajax-Northrup" high-frequency furnace for melting one ton of steel per hour from leading French steelmakers, who are already using a smaller unit. The installation is said to be of four times larger capacity than any high-frequency furnace yet constructed. The furnace will be of 650-kW capacity. Other important contracts recently concluded are for several "Ajax-Wyatt" furnaces for brass melting for France, including an installation for the well-known Renault motor works, and batteries of six and five "Ajax-Wyatt" furnaces respectively have just been put into operation in the same country. In England during the last two months several contracts have been undertaken for "Ajax-Northrup" high-frequency furnaces and "Ajax-Wyatt" furnaces. Two 240-kW furnaces for the heat treatment of aluminium alloys have just been completed in Coventry, and orders have been received for furnaces varying from 40 to 100 kW for enamelling, and heat treatment of steel. The company is also constructing a double-tunnel continuous furnace with regenerative features, over 100 ft. in length, in the Potteries, for the heating of ceramic goods. Orders for ten electrically-heated core ovens have also been received from British and Colonial Government departments.

New Luxemburg Company.

Under the title La Société de Transport d'Energie Electrique du Grand Duché de Luxembourg ("Sotel") a company has lately been organised by a number of metallurgical concerns and collieries in Luxemburg and Lorraine to establish a 75,000-V transmission line to connect the various large industrial works in the Grand Duchy. The line will also be linked up with that serving the metallurgical works in Lorraine.

Book Notices.

We have received a copy of the first number of "The Retail Credit World" (69, Fleet Street, E.C.4; 10s. per annum, post free). The new periodical, which is to be published monthly, will cover all matters relating to credit trading, and will accordingly embrace hire-purchase schemes. On this account it will be of interest to electrical traders who employ, or are considering the employment of, the instalment system. One article in this issue deals with the "Hornby" meter as a means of automatically collecting hire-purchase instalments.

Messrs. PHILIPS LAMPS, LTD., have sent us the May issue (which is the first) of their house magazine. It is a bright production, and there are two or three good articles for general reading, but only the initiated will comprehend the whole of its contents.

"Fencing and Other Safety Precautions for Machinery at Mines." Safety Pamphlet No. 5, issued by the Mines Department (Stationery Office, price 6d. net).—The object of this pamphlet, which contains chapters devoted to transmission machinery, haulage and other plant used underground, and to surface plant commonly used at mines, is to emphasise the dangers which arise from lack of protection of the moving parts of machinery, and to help to promote generally a knowledge of the most effective safeguards for different kinds of machinery under the varying conditions of use.

"Modern Leather Belting." Issued by Messrs. Graton and Knight, Ltd., 2, Pembroke Street, N.1.—This book contains much practical information on the care and operation of leather belting for modern power transmission, and, it is claimed, many data which have never before been published. There are also many illustrations of the firm's products in service. Messrs. Graton & Knight will be pleased to send a free copy of the book to any one interested.

"Experimental Science for Technical Students." By R. W. Hutchinson. Pp. vii+277; figs. 210. London: W. B. Clive, University Tutorial Press, Ltd. Price 4s. 6d.

Technologic Papers of the U.S.A. Bureau of Standards.—No. 359, "A Superheat Meter or Differential Thermometer for Airships" (10 cents).

"Science Abstracts," A & B. Vol. XXXI. Part 4. April 25th, 1928. London: E. & F. N. Spon, Ltd. Price 3s. each.

"Text Book of Telegraphy," by A. E. Stone. Pp. vii+455; 386 figs. London: Macmillan & Co., Ltd. Price 20s. net.

Projected French Electrical Exhibition.

The French Union des Syndicats de l'Electricité is taking the initial steps for the organisation of an International Electrical Exhibition, to be held in Paris in 1931.

The Market in Ecuador.

The openings offered by the market in Ecuador for electrical material and apparatus are at present not many, owing to the limited industrial development of the country, but the use of electricity is on the increase, and important installations are under consideration. The market is entirely dependent upon electrical imports. At present the trade is in the hands of the United States and Germany, but it is not possible to state its value, as no statistics are available. Domestic electrical equipment is the class of goods most in demand to-day, and this section of the market may expand rapidly. Ecuador has great natural resources, and it will be an easy matter to install along its rivers hydro-electric plants as soon as the economic situation of the country permits. Buyers exhibit a preference for United States and German goods on account of the easy terms accorded by exporters in those countries. Trade representatives for Ecuador should have an excellent knowledge of South American business customs and conditions, or, better still, be resident in the country—in the latter case they will be better able to judge the credit of buyers.

Possibilities in Costa Rica.

Though Costa Rica, the Central American Republic, has a population of less than half-a-million, it seems to have potentialities as a market for electrical goods. A very rainy country, and one where there is also plenty of water from melting snow, it has ample power resources. Dynamos, cables, lamps, electric cookers, and other domestic appliances are all said to be all articles on which sales endeavours might concentrate. There is at present a fair trade in such goods, now supplied almost exclusively by United States and German firms. There is little opening for high-power machinery, as Costa Rica possesses no important industries. The usual custom is to pay 60 or 90 days after the delivery of the goods. In packing it is necessary to take precautions against a moist hot climate and very rough handling.

A Tough Specimen.

We have received from Messrs. Joseph Kaye & Sons, Ltd., Leeds, one of their "K" oil feeders, which was run over by a lorry; although the oilcan is dented, it is still usable, the serrated joint having passed through this severe trial without opening. The body of the oil feeder is made of solid drawn steel.

Social Event.

The seventh annual staff dinner of Watson & Sons (Electro-Medical), Ltd., was held at Pagani's Restaurant on April 20th, and was very successful, about 100 members of the staff being present. Mr. Leslie C. Gamage took the chair, and was supported by Mr. Geoffrey Pearce, managing director, and several other directors. "The Chairman" was proposed by Mr. H. C. Gough, the firm's chief engineer, and Mr. Gamage responded. The Charles Watson Challenge Trophy, presented by Mr. Charles H. Watson for all-round athletic achievement, was presented to the winners, Miss Annie S. Willis and Mr. Charles S. Hollis. The entertainment after the dinner was arranged by Mr. J. W. Haynes. Several of the items were performed by members of the staff and had topical reference to the activities of the firm.

Unfair Trading.

With reference to the letter of the Hurley Machine Co. appearing in our issue of April 20th, p. 682, Messrs. Thor Lamps & Supplies, Ltd., of 11, Windsor Place, Cardiff, have sent us a copy of a communication that they have addressed to that company. The effect of this is to draw attention to the fact that Messrs. Thor Lamps & Supplies, Ltd., own the Thor trade mark in so far as it applies to safety lamps of their manufacture, and these are manufactured entirely in this country.

Unemployment.

The Ministry of Labour states that on April 16th the total number of persons on the registers of employment exchanges in Great Britain was 1,083,800. This was 41,865 more than on April 2nd, 1928, but 22,640 less than a year ago.

New Municipal Showrooms.

CARDIFF.—The new showrooms of the Cardiff Electricity Department in St. Mary Street were opened recently by Councillor A. E. Gough, chairman of the Electricity Committee. The site is in a prominent position, and the premises are provided with ample and attractive show windows. At the rear of the showrooms are demonstration rooms for electric cooking, labour-saving, &c.

ABERDEEN.—The Electricity Committee is considering a scheme to equip the Corporation premises in Union Street as up-to-date showrooms. A deputation from the Committee which inspected the showrooms at Hackney, Battersea, Croydon, and Derby recommends that a new showroom should be laid out, the front portion to be furnished as a lounge or waiting room, with a display of appliances included, lighting fittings to be shown in rooms or alcoves, and a demonstration room to be provided capable of seating from 20 to 30 people.

Catalogues for Java.

The British Commercial Agent at Batavia (Mr. H. A. N. Bluett) reports that a local firm is desirous of receiving illustrated catalogues, price lists and samples from British manufacturers of flashlights, torches, and batteries. Firms desirous of supplying flashlights, &c., of United Kingdom manufacture, can obtain further particulars of this inquiry on application to the Department of Overseas Trade, 35, Old Queen Street, S.W.1. (Reference B.X. 4383.)

For Sale.

Salford Board of Guardians invites offers for surplus generating plant, &c. The liquidator and receiver (Mr. H. A. Pepper), of W. Soutter & Sons, Ltd., makers of electrical fittings, &c., Farm Street Works, Birmingham, invites offers for the freehold works, plant, machinery, stock-in-trade, &c., as a going concern. (See our advertisement pages to-day.)

The Bristol Electric Club.

About 36 members recently took part in a golf competition at the Knowle Golf Club for a cup presented by Mr. P. W. Mitchell. Mr. R. H. Orchard secured the cup, which he will hold for one year. He also receives a replica, and wins two-thirds of the sweepstake. Messrs. Mitchell and Ford divided one-third of the "sweep." It is hoped that more members will take part in the Langdon Cup Competition, details of which will be announced later.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price May 1st.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	9½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£105 to £112	...
b	,, Wire ... ... per lb.	1/8 to 1/9	...
b	,, Sheet ... ... ,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£209	...
	Grade II ... ... ,, ,,	£145	...
	Grade III ... ... ,, ,,	£77	...
c	Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c	,, Tubes (solid drawn) ... ... ,,	11¼d. to 1/-	...
c	,, Wire, basis ... ... ,,	9¼d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1	...
c	,, Bars (best selected) ... per ton.	£92	...
c	,, Sheet ... ... ,,	£94	...
c	,, Rod ... ... ,,	£92	...
d	,, (Electrolytic) Bars ... ,,	£67	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£77	...
d	,, ,, H.C. Wire per lb.	9¾d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	6/8	...
h	India rubber, Para fine ... ... ,,	10d.	...
l	Iron Pig (Cleveland No. 3.) ... per ton.	65/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£21 15s.	5s. inc.
g	Mercury ... ... per bot.	£22 5s. to £22 10s.	...
e	Mica (in original cases) small ... per lb.	3d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/8½	...
p	,, ,, drawn bars & rods ,,	1/8	...
p	,, ,, rolled strip & sheet ,,	1/2½	...
p	,, ,, wire... ... ... ,,	1/3½	...
e	Platinum ... ... per oz.	£17 15s.	...
d	Silicium Bronze Wire ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ,,	7¼d.	...
n	Tin, Block (English) ... ... per ton.	£230 to £231	£5 10s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	2/10	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their letter dated April 28th Messrs. James Forster and Co. stated that the recent advance and tightness in the near lead position was caused by a large order from Russia for prompt shipment, in consequence of which surplus supplies were drawn from this market. As soon as the demand was satisfied, prices slipped back again, and the contango, which had ruled for so long, reappeared. The advance brought out a few buyers for prompt delivery, but apart from this no increase in demand from home consumers was apparent. Imports, owing to the Russian demand, have been moderate. The future was obscure, but the position had undoubtedly undergone an improvement this month.

Lighting and Power Notes.

Australia.—BRISBANE (Q.).—We have received from Mr. J. H. Hindman, manager of the city electricity undertaking, a copy of his report, together with the statement of accounts for the year ended December 31st last. The total revenue amounted to £193,987, and working expenses were £133,134, leaving a gross profit of £60,853. The figures for the preceding year were:—Income, £163,496; working expenses, £100,808; gross profit, £62,688. After payment of capital charges there was a net surplus of £19,339, as compared with £21,849 in the previous year. The Department obtains its supply in bulk from the City Electric Light Co., Ltd., and the Tramways Department and the total purchased was 11,464,784 kWh as against 8,378,331 kWh. The sales of electrical energy increased from 7,231,607 to 9,883,543 kWh. It is anticipated that the Department will shortly be in a position to obtain a portion of its supply of electricity from the Council's new power house at New Farm.

Barking Town.—ELECTRICAL PROGRESS.—The Urban District Council reports that during the past year 446 consumers have been connected. The maximum demand reached 1,584 kW, and the number of kWh purchased in bulk totalled 4,378,299, as compared with 3,452,039 for the previous year. The showroom in Ripple Road is nearing completion.

Birmingham.—ELECTRICAL PROGRESS.—According to the *Birmingham Post*, there was a record sale of electricity in the city last year. At a meeting of the Electric Supply Committee on April 25th, it was reported that the total sales of electricity during the financial year ended March 31st showed a record increase of 46¼ million kWh, to a total of 281 million kWh, this being an increase of nearly 20 per cent. on the sales for the previous year. The highest previous annual increment was 34 million kWh during the war material production period (*i.e.*, 1916 over 1915). The number of consumers of electricity increased during the year by 9,753, the total number of consumers having more than doubled during the past three years. The probable effect on the immediate future of the undertaking of the Central England Electricity Scheme, published recently, was also the subject of consideration. Negotiations with the Central Electricity Board are taking place, and it was decided to make a full report at the June meeting of the City Council.

Brighton.—STREET LIGHTING.—At a recent meeting of the Corporation Electricity Committee, the electrical engineer recommended that the system of improved lighting recently carried out in London Road should be extended to all the main thoroughfares throughout the town. He estimated the cost of carrying out the work at approximately £3,000, in addition to which the extra cost for electricity would be £3,600 per annum plus £200 for lamp renewals and maintenance. The recommendation was approved.

LOAN SANCTIONED.—The Committee has obtained sanction to borrow £4,900 for l.p. feeder mains, and £5,236 for the installation of l.p. switchgear at North Road sub-station.

Canada.—ELECTRICAL DEVELOPMENT.—The Montreal Engineering Company will shortly begin the construction of the first unit of a large power plant in the Estevan coal fields of Saskatchewan, which when completed will cost $750,000, and will represent the first actual development of power in Saskatchewan by a central generating station for distribution over a wide territory. Several municipalities have already contracted with the company for a supply of power.

The imports of electrical energy into Canada during 1927 amounted to 5,020,374 kWh, as compared with 5,353,833 kWh in 1926. The exports of power to the United States totalled 1,632,613,570 kWh, as against 1,506,002,197 kWh in 1926.

Colchester.—ELECTRICITY IN BULK.—On behalf of the Brightlingsea Electricity Supply Co., Ltd., Mr. A. Hugh Seabrook is inquiring terms from the Colchester Corporation for bulk supply, with a guaranteed date when the supply can be available.

Continental.—AUSTRIA.—At the last sitting of the Vienna City Council expenditure aggregating 58 million Sch. (nearly £1,750,000) was sanctioned. Of this sum £1,500,000 will be spent on the municipal electrical works.—*Reuter* (Vienna).

CZECHO-SLOVAKIA. — According to a report drawn up by the Czecho-Slovakian Water Utilisation Department, by the regulation and utilisation of the River Moldau between Prague and Budweris, a total of 300,000 h.p. and 700 million kWh per annum can be rendered available. A commencement is being made by the erection of dams near Stechovice and Slapy which will provide 100,000 h.p. for a projected hydro-electric power station near Prague.

ITALY.—According to a report just issued by the General Fascist Confederation of Italian Industries, during the last seven years the consumption of electricity in Italy has doubled. In 1919-20 it was 3,696 million kWh, and in 1925-26 7,360 kWh. In 1926 the *per capita* consumption of electricity was estimated at 185 kWh per annum. Hydro-electric plants which will increase the present annual output by 3,000 million kWh are now under construction and will be put into commission in the course of the next four years. It has been estimated that by utilising fully the water available for power purposes in the Alps and the Apennines a total approximating 26,000 million kWh could be generated. To ensure full utilisation, the hydro-electric plants must be supplemented by a certain number of steam generating plants, some of which have been erected while others are now being planned. Their assistance is required to make up for deficiency of water power in years of scanty rainfall.

Ealing.—CHANGE-OVER.—The Town Council has agreed to the proposal of the Uxbridge and District Electric Supply Co., Ltd., to change the pressure of electricity supply given under the company's Order (1903) to a.c., 230 V, single-phase, and 400 V, 3-phase, 50 cycles.

Finchley.—LOAN.—The Urban District Council Electricity Committee is applying for sanction to the borrowing of £2,839 for the extension of the Percy Road sub-station.

Glasgow.—CENTRAL SCOTLAND SCHEME.—At a recent meeting of the Corporation Electricity Committee, the town clerk submitted correspondence between the general manager and the district engineer of the Central Electricity Board regarding the scheme for the Scottish Central area, in which provision is being made at the Paisley sub-station of the Board for a supply of energy being given there for transmission to the Govan sub-station, from which it appears that the general manager of the department has agreed to take a supply from the grid at Paisley sub-station of approximately 10,000 kW by about 1931, 20,000 kW in 1932, and 30,000 kW in 1933, and that the charge for energy supplied at Paisley would be at the grid tariff and not at the same rate as energy supplied at Dalmarnock, *i.e.*, under "selected-station" conditions. The Committee instructed the town clerk to inform the Board that the manager, in agreeing to take a supply of energy from the Paisley sub-station, was acting outside his powers and without the authority of the Corporation; that the Corporation repudiates any liability for the undertaking given by the manager to take such a supply; and that it is not to be held to be committed to take a supply from that sub-station.

MAINS EXTENSIONS.—The Committee has authorised mains extensions at a cost of £14,000.

Guildford.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to loans of £3,358 for mains and £1,367 for sub-station equipment.

In order to maintain the pressure in the Abbotswood and Merrow districts the Committee has decided to lay a new main and install a transformer at a cost of £3,545.

Irish Free State.—SHANNON SCHEME PROGRESS.—Regarding the progress that is being made with the Shannon scheme transmission system in County Cork, the line from Waterford to Cork City is now completed. Cork is now being made the centre of erection operations for the southern section, and from there on through Mallow. Considerable progress has been made with the erection of standards for the line to Killarney. About 500 standards will be required for this line, and 300 have been erected. The line from Cork City to Mallow has been completed, and by next June the line to Killarney will be finished.

HOWTH (CO. DUBLIN).—The Urban District Council has decided to apply to the Local Government Department for sanction to a loan of £3,000 required for the extension of electric lighting in the town.

London.—FULHAM.—The Borough Council Electricity Committee proposes to lay a h.p. cable from the new Barclay sub-station to North End Road at an estimated cost of £2,161. Other mains extensions are to be carried out at a cost of £3,182.

Ludlow.—STREET LIGHTING.—The Town Council has accepted the tender of the Ludlow Electric Light & Power Co., Ltd., for street lighting on a five years' contract.

Morecambe.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £10,000 for extensions to the distribution system.

North-West Midlands.—INQUIRY.—The Electricity Commissioners are to hold an inquiry at the Town Hall, Stoke-on-Trent, on May 15th with reference to the proposed formation of the North-West Midlands Electricity District, and in order finally to determine the area of the proposed district.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LEAMINGTON.—*The Midland Electric Light and Power Co., Ltd.*—Lighting: From 7d. to 6½d. per kWh. Power: From 4d. to 3d. per kWh.

MELTON MOWBRAY.—*The Melton Mowbray Electric Light Co., Ltd.*—Lighting: Flat rate from 9½d. to 9d. per kWh.

STROUD.—*The Stroud Electric Supply Co., Ltd.*—Lighting: A flat rate of 8d. per kWh.

Scarborough.—ILLUMINATION SCHEME.—The Town Council has approved a scheme of electrical illumination for the whole sea-frontage (both North and South Bays, and also the Castle Hill) for the coming summer season. The estimated cost of the additional installation is £5,800. There will be floodlighting of the keep and battlements of the Castle, strip lighting and decorative lighting on the north and south foreshore promenades, and in the sea-front gardens, roof pedestal

lights at the North Bay Corner Café, increased ornamental lighting at Peasholme Park, and flood-lighting of the Town Hall.

Shipley.—ELECTRICITY FINANCE.—The Electricity Committee recently reported to the Urban District Council that a debit balance of £3,000 on the Electricity Department at the beginning of the year, due to the effects of the 1926 coal dispute, had been wiped out by the effect of the excellent arrangements made with the Yorkshire Electric Power Co., and that at the end of the year there would be a substantial balance in hand which would enable the Committee to carry out its promise of a reduced charge to consumers on July 1st.

Special Orders.—Application has been made to the Electricity Commissioners for Special Orders by the Cleveland and Durham County Electric Power Co. authorising it to supply electricity in the urban districts of Stanhope and Tow Law, and part of the rural district of Weardale; and the Urban District Council of Whitby, to supply electricity to certain parishes in the rural district of Whitby.

Stoke-on-Trent.—LOAN.—The Corporation Electricity Committee is to apply for sanction to a loan of £5,000 for the assisted wiring scheme.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical World*, the plant of the Carolina Power and Light Company on the Pigeon River in North Carolina, near the Tennessee State line, will be completed next year with a capacity of 90,000 h.p., to be raised ultimately to 135,000 h.p. This development makes use of a relatively small mountain river, but diverting it through a tunnel in the mountains over four miles long enables the water to fall down the mountain sides through steel pipes to a power house far removed from the dam, thereby developing a total fall of 661 ft. The plant, when it is ready, will follow three others in North Carolina which have just gone into operation or will soon do so. These are the Santeetlah plant of the Tallassee Power Company, supplying the Aluminium Company of America, where a 66,000-h.p. installation is now in operation; the Carolina Power and Light Company's Norwood plant on the Yadkin River, with 83,000 h.p., and the Duke Power Company's Oxford Shoals plant on the Catawba, near Hickory, with 56,000 h.p. With the Duke Power Company's completion of its hydro-electric plant at Oxford Shoals and the letting of contracts in connection with the first 112,000-kW unit for its coming steam plant at Riverbend, on the Catawba, designed to produce ultimately 450,000 kW, and which will cost more than $20,000,000, it is forecast that the Piedmont section of the Carolinas will experience an inflow of new business.

Walsall.—ELECTRICITY SUPPLY.—The Council has approved recommendations by the Electric Supply Committee for extensions to mains and the provision of sub-stations, transformers, and switchgear at various points at an estimated cost of £6,425, and further extensions at an estimated cost of £3,150, to supply electricity to the houses to be erected by the Corporation at North Walsall, Maw Green, New Mills, and Dale Street.

West Africa.—SAO THOME.—The Government of Sao Thomé, the Portuguese island colony in the Bight of Benin, has asked the Allgemeine Elektricitäts Gesellschaft, of Berlin, to carry out an investigation with a view to determining the best means of utilising the water power of the Contador Falls, in the north-western part of the island. It is believed that these falls could yield about 6,800 kW, and that the cost of the power plant would be approximately £170,000. Cocoa could be dried by means of electrical machines, while electricity could also be used for the transport of the product. The Reparations Commission of the Ministry of the Colonies has given its approval to a part of the war reparations payments for the Colonies being assigned to the Sao Thomé project, leaving about £60,000 to be provided by the Colony itself.—*Reuter* (Lisbon).

Tramway and Railway Notes.

Blackpool.—YEAR'S WORKING.—The Corporation tramcars and omnibuses carried an average of nearly a million passengers a week during the past year. The tramway record was: Passengers, 42,524,856 (increase 4,858,605); receipts, £313,258 (increase £34,001). The aggregate distance covered by the trams and omnibuses was over 4½ million miles. The average receipts per car-mile were almost 1s. 11d., and for the omnibuses just over 11d.

Glasgow.—FARES.—At a meeting of the Corporation Tramways Committee on April 23rd, it was decided to recommend that the ½d. fares which were put into operation in July last, should be withdrawn at the end of the present financial year. This is the third time that ½d. fares have been withdrawn.

Irish Free State.—DUBLIN.—The work on the reconstruction of the Dublin-Lucan electric railway, which is being taken over by the Dublin United Tramways Company and is being linked up with the city services, is now almost completed, and it is hoped to have a service in full operation by about June.

According to the *Electric Railway and Tramway Journal*, application has been made to the Irish Railways Tribunal for sanction to a proposed agreement between the G.S.R. Co. and the Dublin United Tramways Co. to establish a pool of so much of the receipts of the two companies between Dublin and Dalkey as can be regarded as competitive. Mr. M. F. Keogh explained that the chief object of the proposed agreement was to prevent uneconomic competition between the two companies. The tramway lines of the company, running parallel with, and at no great distance from, the Dun Laoghaire branch of the Railway Co., involved intensive competition for business throughout the districts jointly served. During recent years the competition had tended to increase. This competition had reached a stage that, if continued proportionately, there was grave risk that the traffic would become unremunerative to either competitor. The object in view in entering into an agreement was to remove the incentive to increase competitive efforts, whilst at the same time preserving full freedom of action in other respects for both parties. The basis of agreement, Mr. Keogh said, was a pool of so much of the gross receipts of either party as could be regarded as competitive, the contents of the joint purse to be distributed in ratio to the actual earnings during an agreed period.

Japan.—NEW ELECTRIC RAILWAY.—The Bungo Railway Co., Ltd., is being formed, with a capital of 6,000,000 yen, for the construction of an electric railway between Fukuyama and Tojo, a distance of 44 miles.

Lowestoft.—ABANDONMENT OF RAILLESS CARS.—A special committee of the Corporation has recommended the discontinuance of the present system of railless cars and the introduction of motor omnibuses.

Madagascar.—RAILWAY ELECTRIFICATION.—The Government has approved a scheme which includes the partial electrification of the Tananarive-East Coast railway at an estimated cost of £166,000 (not including electric locomotives). The work will require about six years for completion. Operations should have been commenced in 1926, but have had to be postponed. It is estimated that the entire line from Junck to Tananarive, which rises constantly through a mountainous country, could be electrified at a cost of £500,000, but at present only the section having the heaviest gradients and sharpest curves is included in the project. This is the section between Junck and Perinet, 39 miles in length.

Southend-on-Sea.—RAILLESS CARS.—The Corporation has adopted a recommendation of the Light Railways and Electric Lighting Committee that the tramway track to Prittlewell in Victoria Avenue be abandoned and a railless-car service to Whitegate Road be substituted.

Telegraph and Telephone Notes.

Australia.—TELEPHONE AND TELEGRAPH SERVICES.—The Postmaster-General's report for the year ended June 30th, 1927, indicates that the losses resulting from the working of the telephone and telegraph branches of his Department amounted to £339,000 and £278,000 respectively. According to the Melbourne *Argus*, a reduction representing £20,806 in the volume of telegram traffic is considered to be due in a great measure to the broadcasting of sporting results by wireless, although in Queensland the drought conditions prevailing throughout the year also affected the business considerably. An actual improvement of £38,761 in the telephone branch was converted into an apparent loss by the transfer from the telegraph branch of the responsibility of certain trunk lines used for both telephone and telegraph traffic. A special economy campaign for reducing interest charges by reduction of stores resulted in a reduction of stores held by £420,000. Telephone trunk-line calls increased from 21,675,450 in 1924-5 to 29,022,130 in 1926-7; the service between Melbourne and Sydney has become so popular that it is proposed to replace the present three-channel system, which permits of the transmission of five messages, telegraphic and verbal, simultaneously, to a system which will enable eight simultaneous conversations to be carried on. These facilities will probably be in operation before the end of the year. Two additional channels will shortly be provided between Sydney and Brisbane, and the line between Melbourne and Adelaide has recently been reconstructed. When all the improved facilities are in operation it is anticipated that satisfactory conversation will be possible over a distance of 3,000 miles between Adelaide and Cairns. Investigations are proceeding for the linking of Adelaide and Perth by a direct trunk-line, and progress is being made in North Queensland. The number of telephones in the Commonwealth at the end of the year was 442,362, connected with 5,482 exchanges, the number of new exchanges established since June 30th, 1926, being 387.

Irish Free State.—TELEGRAPH SERVICE.—The Irish Free State Budget was introduced to Parliament in Dublin on April 25th by the Minister of Finance. One of its chief features was the increase of the minimum charge for telegrams (12 words) from 1s. to 1s. 6d.

Imperial Communications.—OFFER OF PURCHASE.—A rumour in the House of Commons last week was to the effect that a new and powerful industrial and financial syndicate had made an offer to the Government for the purchase of the Imperial cable and radio-telegraph services. The *Financial News* has reason to believe that the Government has declined the offer.

Sweden.—TELEPHONES AT STOCKHOLM.—According to the latest figures, 28 per cent. of the inhabitants of Stockholm possess telephones connected with the Swedish system. Probably in no town in the world is the telephone system more highly developed; in the case of Washington, U.S.A., the corresponding figure is given as 26 per cent. The position at Stockholm is a natural consequence of its being the seat of the manufacture of telephone apparatus.—*Reuter's Trade Service* (Stockholm).

The Telephone Service.—NEW EXCHANGE.—The new automatic telephone exchange at Keighley was put into operation on April 28th. The actual engineering work has been completed some little time.

Radio Notes.

Australia.—LICENCES.—It is reported that over half the broadcast radio-telephone receiving licences issued in Australia are held in Victoria. It is estimated that approximately 300,000 licences are current throughout the country, the revenue from which must be at least £360,000 per year.

RELAY STATIONS.—The Postmaster-General recently explained in the House of Representatives that the Government was anxious that all States should have the same facilities. In a short while it would be possible to relay one programme to the whole of the listeners in Australia, by which means alone people "outback" would receive a good service. The redistribution of "A"-class stations was necessary: one of these stations broadcasting on two wave-lengths at the same time would cater for the same listeners on the same wave-lengths as at present; on the second, and lower, wave-length it would serve a relay station, which would in turn supply listeners within its radius. Relay stations should be established by the companies, and close co-operation between them was the only way in which the whole of Australia could be well served. The Government would retain its control, and would govern the whole position. Therefore, no monopoly could possibly occur.

PROPOSED "HALL MARK."—The Postmaster-General has been influenced by complaints of the unsatisfactory nature of many receiving sets sold in Australia, to suggest to the broadcasting companies and other controllers of wireless activities that they should establish a committee, whose task would be to test circuits, approve designs for sets, and grant the right to use a hall mark, which in time would come to be regarded as a guarantee of excellence.

Holland.—SHORT-WAVE TRANSMISSION.—The times of transmission of the 30-m. Dutch station (PCJJ) of Messrs. Philips Lamps, Ltd., have been modified. Until further notice it will operate on Tuesdays and Thursdays from 16.00 to 20.00; on Fridays from 23.00 to 02.00 (Saturday); and on Saturdays from 15.00 to 18.00 G.m.t.

Hungary.—NEW STATION.—The opening of the Budapest Radio Spring Trade Fair on April 28th was chosen as the date of inaugurating the new 60-kW station, the special identification signal of which is a chime. It is run by a private company, but is controlled in close association with the official Press Bureau.

Licences.—STILL INCREASING.—The total number of broadcast radio-telephone receiving licences issued in this country up to the end of March, 1928, reached 2,470,696, in addition to 12,234 issued free to blind persons. The total is an increase of 20,000 on the February figure.

Regional Broadcasting.—FIRST TWIN-WAVE STATION.—The Postmaster-General has sanctioned the erection of the first of the new high-power twin-wavelength stations contemplated by the British Broadcasting Corporation in its regional scheme. The new station will be in the north of London. Work will begin shortly on its construction, and it is anticipated that the station will be opened for service within from twelve to fifteen months' time. It may be added that tests have been carried out on a site on high ground between Potters Bar and Hatfield, near to Kentishlane Farm, Woodhall.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—June 8th. Department of Sanitary Works for the Nation. Two groups of electrical sewage pumps for the Military College and Aviation Camp. (A. 6186.)*

Australia.—MELBOURNE.—September 3rd. State Electricity Commission of Victoria. 120,000-V switchgear for Richmond terminal station; 135,000-V switchgear for Yallourn power station extension. (April 20th.)

June 25th. 2,000, or, alternatively, 12,000 tensioning and suspension disk-type insulators. (B.X. 4382.)*

June 12th. Postmaster-General's Department. Resistances and reactances. (B.X. 4359.)*

SYDNEY.—August 29th, 1928. N.S.W. Government Railways. Two 20,000-kW turbo-alternators and condensing plant for Ultimo power house. Spec. No. 816 (price 15s.), from Chief Electrical Engineer, 61, Hunter Street, Sydney.

Belfast.—May 19th. Electricity Department. One 1,000-kW rotary-convertor, with transformer, l.p. a.c. switchgear, one 500-kW ditto ditto. (See this issue.)*

Belgium.—IXELLES.—May 9th. Municipal Council. Electric meters. (B.X. 4388.)*

Birmingham.—May 16th. Birmingham Tame and Rea District Drainage Board. 5¼ miles e.h.p. cable. (April 27th.)

Blackburn.—May 7th. Electricity Department. Two duplex natural draught cooling towers, each 500,000 gallons per hour capacity. (April 20th.)

Bradford.—May 12th. Tramways Committee. Supply of electric trolley vehicles and double-deck motor omnibuses, delivered complete and ready for service. Information from Mr. R. H. Wilkinson, general manager, Corporation Tramways, 7, Hall Ings, Bradford.

Bulgaria.—TROYON.—May 30th. Water Syndicate. Pipe lines, water turbines, generators, switchgear and accessories. (B.X. 4378.)*

Canada.—WINNIPEG.—1- to 50-kW self-contained gasoline or oil operated electric lighting plants using a standard three-wire 110/220-V 60-cycle generator. (B.X. 4391.)*

Chatburn (near Clitheroe).—May 7th. Electric lighting installation at the Wesleyan Chapel and school. Specifications from Mr. H. Parkinson, Chatburn.

Cheadle and Gatley.—May 11th. Electricity Department. Contract No. 38. E.h.p. and m.p. switchgear. Specifications, &c. (£1 1s.) from Mr. R. W. Willis, electrical engineer and manager.

Colchester.—May 30th. Electricity Committee. One 250-kVA transformer, one e.h.p. switch cubicle, four l.p. oil circuit breakers, &c., 5,450 yd. l.p. cables, &c. (See this issue.)

Edinburgh.—May 7th. Electricity Department. Plant for the Portobello generating station. Four steam generating units, &c., evaporation 65/80,000 lb. per hour. Eight mechanical stokers, with driving gear, suspended arches, ash hoppers, &c. Specification, &c., from Mr. Edwin Seddon, engineer and manager (deposit of £2 2s.).

Egypt.—CAIRO.—June 16th. Ministry of the Interior. One 300-h.p. Diesel engine, direct coupled to a 250-kVA alternator, for the Damanhour power station extension. (B.X. 4349.)*

Glasgow.—May 17th. Electricity Department. Twelve months' supply of l.p. cables, small i.r. insulated cables and flexibles, meters, and carbons. (See this issue.)

Halifax.—May 12th. Installation of electric lighting at the Sanatorium, Green Lane, Shelf. Specifications from Borough Engineer, Crossley Street (deposit of one guinea).

India.—May 8th. India Stores Department. 4,000 lb. silk-covered copper wire. (April 20th.)

May 18th. 6,500 2, 3, 4 and 6 conductor telephone cords. (See this issue.)

Leeds.—May 9th. City Property Committee. Installation of electrical switchgear at the Cookridge Street baths, Leeds. Mr. W. T. Lancashire, city engineer, Municipal Buildings.

London.—ST. PANCRAS.—May 11th. Electricity Department. Two 1,000-kW and three 2,500-kW motor convertors. (April 20th.)

METROPOLITAN ASYLUMS BOARD.—May 9th. Extension to the electric lighting installation at the South-Eastern Ambulance Station, New Cross Road, S.E. (April 27th.)

H.M. COMMISSIONERS OF WORKS.—May 14th. Incandescent electric lamps. May 15th. Fuseboards and switches. (See this issue.)

Manchester.—May 16th. Electricity Committee. 33,000-V and 6,600-V switchgear, also switch-operating batteries and charging gear. (April 27th.)

New Zealand.—WELLINGTON.—May 8th. Post and Telegraph Department. Supply of 1.5-V dry cells. (B.X. 4399.)*

Perth.—May 7th. Electricity Department. L.p. feeder and pilot cables. (April 27th.)

Ripon.—May 19th. Electricity Department. E.h.p. and l.p. cables, boxes, roadwork and public lighting. (April 20th.)

Southampton.—May 29th. Electricity Committee. One 15,000-kW turbo-alternator set, with condensing plant, 2,000-kW rotary-convertor set, with transformer, starting panel, e.h.p. switch cubicles, control panels, boiler feed, &c. (April 27th.)

South Africa.—PRETORIA.—May 31st. Department of Posts and Telegraphs. Outdoor distribution boxes for 15-pair telephone cable and magneto and central battery switchboards. (B.X. 4324.)*

June 7th. Telephone cable, copper wire, &c. (B.X. 4335.)*

JOHANNESBURG.—May 25th. Municipal Council. 6,600- and 3,300-V switchgear, with cables, signalling and telephone apparatus, and power and lighting transformers. (B.X. 4371.)*

DURBAN.—June 1st. Corporation. One 100-kVA 3-phase transformer. (B.X. 4395.)*

Stone.—May 8th. Urban District Council. E.h.p. overhead electric transmission line, &c. (April 20th.)

West Riding.—May 15th. Installation of electric lighting at Bramley and Wickersley new school. Education Department, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bexhill.—Electricity Committee. Accepted:—
H.p. main to Little Common sub-station (£8,662).—W. T. Glover & Co., Ltd.

Birmingham.—Electricity Committee. Accepted:—
Overhead electric transmission lines at Solihull, Knowle, and Copt Heath.—Callender's Cable & Construction Co., Ltd.
Switchgear for various sub-stations.—Ferguson, Pailin, Ltd.
Rotary-convertor apparatus for Bordesley, Alma Street, Greet and Parker Street sub-stations.—Electric Construction Co., Ltd.
Tramways Committee. Accepted:—
50 double-deck tramcar bodies with top covers.—Brush Electrical Engineering Co., Ltd.
50 air-brake equipments for tramcars.—Electro-Mechanical Brake Co., Ltd.
100 electric motors for tramcars.—English Electric Co., Ltd.

Colchester.—Electricity Committee. Recommended:—
Cable (£6,246).—W. T. Henley's Telegraph Works Co., Ltd.

Croydon.—Electricity Committee. Accepted:—
Converting valves to motor operation (£444).—J. Blakeborough & Sons, Ltd.
Motor-generator set (£575).—Metropolitan-Vickers Electrical Co., Ltd.
Three switch trucks for sub-stations (£389).—Ferguson, Pailin, Ltd.

Devizes.—Wilts. Standing Joint Committee. Accepted:—
Installing electric lighting at the central police station, Devizes (£175).—James Bros.

Epsom.—Urban Council. Accepted:—
Electric overhead line for supplying electricity for working the adjutators, &c., at the sewage farm (£241).—Hackbridge Cable Co., Ltd.

Glasgow.—Electricity Committee. Recommended:—
Surface-type feed-water heater for No. 5 turbo-alternator set at Dalmarnock (£1,200).—English Electric Co., Ltd.
Meters (£2,875).—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.
Tramway Committee. Accepted:—
Tram-rail grinding machine.—Allen-Liversidge, Ltd.
Switchboard for Elderslie depôt.—New Switchgear Construction Co., Ltd.

Guildford.—Housing Committee. Accepted:—
Wiring 80 flats and 24 houses on the Aldershot Road estate:

BOWDEN & HIGLETT, LTD. (Accepted.) ...	£529
A. Grove	560
Electrical Installations, Ltd.	561
Edgley & Edgley	577
C. F. Williams	634
J. Harris	659
General Electrical Maintenance Co.	670
W. Webb & Co.	710
A. Cozens	779
A. Higginbotham & Son	850
Walker & Billett	988
W. H. Tordoff	1,210

Holmeswood.—Lancashire County Council. Accepted:—
Installation of electric lighting at pumping station (£79).—E. Dewhurst, Ltd.

Ilford.—Electricity Committee. Recommended:—
660-volt cable (schedule prices).—Metropolitan Electric Cable and Construction Co., Ltd.
E.h.p. ditto (schedule prices).—Union Cable Co., Ltd. These were the lowest British tenders, and are subject to adjustment according to the prices of lead and copper.
Batteries for electric vehicles (£106 for tractor, £94 for Orwell, and £154 for Edison).—Fuller Accumulator Co., Ltd.
E.h.p. switchgear for Goodmayes sub-station (£249).—Crompton-Parkinson, Ltd.
Switchgear extensions at Uphall sub-station (£370).—General Electric Co., Ltd.

Leicester.—Electricity Committee.—With further reference to our note on page 737 of the ELECTRICAL REVIEW of April 27th, the Committee has received comprehensive tenders for the plant extensions from International Combustion, Ltd., the English Electric Co., Ltd., and the Foundation Co., Ltd., as well as 14 separate tenders for the different sections. After careful consideration, and on the advice of their engineer, the Committee recommended the International Combustion, Ltd., as main contractors, at £413,535 for the whole work, comprising the following sections:—

Section 1.—Three water-tube boilers, each of 120,000 lb. per hour normal evaporation and 150,000 lb. per hour maximum continuous evaporation, complete with economisers, air preheaters, mechanical draught apparatus, steel chimneys, accessories, instruments, high-pressure steam piping, coal- and ash-handling plant, and complete arrangements for firing and the preparation of coal on the "Lopulco" pulverised fuel system, £168,304.

Section 2 (*a*).—One steam turbo-generator of 25,000 kW, complete with condensing plant, and all accessory apparatus. (This work will be carried out for the company by the English Electric Co., Ltd., as sub-contractors), £80,835.

(*b*) One steam turbo-generator of 1,500 kW maximum continuous rating for the supply of station auxiliaries, complete with all condensing plant and auxiliaries. (This work will be carried out for the company by the Oerlikon Co., Ltd., as sub-contractors), £8,096.

Section 3.—All structural steel work and buildings, complete with raw coal bunkers, and all other civil engineering works. (This work will be carried out by the Mitchell Conveyor and Transporter Co., Ltd., as sub-contractors), £99,000.

Section 4.—Three ferro-concrete natural draught-type cooling towers (2,092,500 gallons of water per hour), complete with ponds, culverts, and outfall weirs. (This work will be carried out for the company by the Mitchell Conveyor and Transporter Co., Ltd., as sub-contractors), £35,900; contingencies, £19,400; and spare parts, £2,000.

Tramways Committee. Accepted:—
Special trackwork (£4,346).—Hadfields, Ltd.

London.—METROPOLITAN ASYLUMS BOARD.—Works Committee.
Installation of cable and switchgear at the Joyce Green Hospital and Long Reach Hospital:—

L. G. TATE & CO., LTD. (Recommended.) ...	£1,485
Electrical Installations, Ltd.	1,497
T. Clarke & Co., Ltd.	1,755
(Alternative)	1,544
Macintosh Cable Co., Ltd.	1,866

Installation of electric bells at the Hostel:—

F. JENKINS & SON. (Recommended.)	£128
T. Clarke & Co., Ltd.	151
Cunningham, Ltd.	156
Alpha Manufacturing & Electrical Co., Ltd. ...	159
Riddle & Goddard, Ltd.	172
L. G. Tate & Co., Ltd.	184
Electrical Contracts & Maintenance Co. (1925), Ltd.	213
Reliance Telephone Co., Ltd.	223
Cole Bros.	228
Gardner, Brown & Co., Ltd.	345

Rugby.—Urban Council. Accepted:—
Cable (£428).—British Insulated Cables, Ltd.
650 yd. stoneware conduits (£51).—Baldwin & Co.
Four h.p. switches (£180).—British Thomson-Houston Co., Ltd.

London.—WESTMINSTER.—Libraries Committee. Recommended:—
Renewal of electric lighting installation at Buckingham Palace Road library:—

COLEBY & Co. (Recommended.)	£422
H. E. Keen & Co., Ltd.	436
Drake & Gorham, Ltd.	470
Buchanan & Curwen	495
Belshaw & Co., Ltd.	637

Salford.—Electricity Committee. Recommended:—
12 months' supply of 3-phase oil-immersed power transformers.—Metropolitan-Vickers Electrical Co., Ltd.
Irwell Conservancy Committee. Recommended:—
Electrically-driven sludge pump at sewage disposal works (£868).—John Shaw & Sons (Salford), Ltd.

Stoke-on-Trent.—Hospital Committee. Accepted:—
Electric main at new nurses' home.—Painter & Madew.
Electricity Committee. Accepted:—
Additional piping and valves at the central power house (£995).—Brightside Foundry & Engineering Co., Ltd.
Overhead wiring and services to 86 houses on various estates (£257).—E. M. Evans & Son, Ltd.
3-ton electric pulley block (£157).—Wharton Crane and Hoist Co., Ltd.

Forthcoming Events.

Junior Institution of Engineers.—Friday, May 4th. 39, Victoria Street, S.W. 7.30 p.m. "The Application of Electricity to Domestic Purposes." Mr. F. C. Dain.
Friday, May 11th. 7.30 p.m. "Notes on the Drying of Industrial Products." Mr. A. T. Henty.

Women's Engineering Society.—Monday, May 7th. 46, Kensington Court. 6.15 p.m. "The Work of the League of Nations in Relation to Trade and Industry." Mrs. W. Layton.

Institute of Metals.—Tuesday, May 8th. Institution of Mechanical Engineers, Storey's Gate, S.W. 8 p.m. Annual May Lecture on "The Chemical Properties of Crystals." Prof. C. H. Desch, F.R.S.

Institute of Marine Engineers.—Tuesday, May 8th. The Institute, Minories. 6.30 p.m. "A Non-chemical Method for the Prevention of Scale Accumulation in Boilers, Diesel Jackets and Water Circulating Systems in General." Mr. A. T. Ridout.

Institute of Fuel.—Wednesday, May 9th. Burlington House, W. 6 p.m. "The Engineer in Industry." Mr. A. J. T. Taylor.

Association of Engineering and Shipbuilding Draughtsmen (Birmingham Area Technical Committee).—Friday, May 11th. Birmingham Chamber of Commerce. 7.30 p.m. "The Limits of Turbo-Generator Design." Mr. W. Sharp.

Physical Society.—Friday, May 11th. Imperial College of Science, S. Kensington, S.W. 5.0 p.m. Ordinary meeting.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

TURNOVER electric toaster.
STERELEX dental outfits.
Ironclad fuses marked H. & Co. set inside a star.
REGENT BLUE daylight fittings.
PITTER electric fans.
TROJAN electric irons.

Notes.

Refuse Disposal Works at Glasgow.

His Royal Highness Prince George, during his visit to Glasgow on April 27th, formally inaugurated the new £600,000 refuse disposal works of the Corporation at Govan. As a souvenir of the occasion, the Prince was presented with a gold cigarette case by Mr. James Todd on behalf of the contractors. The plant combines with refuse disposal the generation of electricity, and is the largest of its kind in the world. Messrs. Heenan & Froude, Ltd., Worcester, were the contractors. It is estimated that the plant will have an output of 50,000,000 kWh per annum. The works, which occupy a site extending to 15½ acres, are capable of disposing of 640 tons of refuse per day. The original estimated cost (£400,000) has been increased by improvements and extensions, by the coal strike, difficulties with the foundations, and by the need for extra buildings and plant to meet the requirements of the Electricity Department and the Electricity Commissioners. The plant has been installed in four sections, so that if one section breaks down the other three will be available. The crude or bulk refuse will be collected and conveyed to the depôt by a fleet of large-capacity electric vehicles recently acquired by the Corporation. One section is the reception house in which, having previously been weighed, the refuse is discharged into four large hoppers. Special electromagnetic separators of high power extract tins and other articles and deposit them in skips. The "tailings" are conveyed to pulverising machines revolving at 960 r.p.m., each coupled to an electric motor of 35 h.p. In the incinerator house are situated the furnaces and boiler equipment. A.c. motors provide the power for driving the works auxiliaries. The charging of the furnaces is accomplished hydraulically. The generating plant is housed in a separate building, and consists of two 5,000-kW turbo-alternators for supplying 3-phase electricity at 50 cycles, 6,500 V, the speed of the sets being 3,000 r.p.m. In conjunction with these are two sets of surface condensing plant and auxiliaries, and each condenser is fitted with an ejector air pump and a centrifugal high-vacuum extraction pump of the opposed impeller type. The current from alternator terminals, at 6,500 V, 50 cycles, is taken to two frequency changers, and then, at 25 cycles, to two banks of single-phase transformers, passing out to the bus-bars at 22,000 V. The electrical energy is transmitted to the Corporation sub-station in Helen Street for disposal. The two frequency changers are arranged for inverted operation, operating either from the 25-cycle or the 50-cycle side. These machines run at 375 r.p.m. The main switchboard was supplied by Messrs. A. Reyrolle & Co., Ltd. The whole of the cabling and wiring in connection with the high- and low-pressure plant in the refuse disposal works was carried out by Messrs. Callender's Cable & Construction Co., Ltd., who also provided the distribution boards and connecting fuse boxes.

Metals for Insulator Moulds.

The members of the Birmingham and Midland Section of the Society of Chemical Industry and the Chemical Group recently paid a visit to the Metallurgical Research Laboratories of the Birmingham Gas Department. Dr. Walter, the engineer-in-charge, stated that he had recently done a large amount of investigational work in connection with metals for the moulding of bakelite and synthetic gums, which were made into insulating material for the electrical and allied industries. The elaborate steel dies which were required needed hardening to prevent distortion, and to keep the working surfaces clean and free from scale. A special furnace had been designed which enabled such dies to be hardened without the formation of any scale on the working surfaces.

Fatalities.

Charles Bitchener, an employé of the Hampstead Borough Council, received a fatal electric shock on April 25th through coming into contact with an electric cable at an underground sub-station at the corner of Priory Road and Abbey Road, Hampstead. He received a shock at 2,000 V. At the inquest on April 27th an electrical expert said that it appeared that Bitchener's spanner had touched a "live" terminal. William Harrison, who was working with deceased and had taken a socket off a h.p. pedestal, suggested that Bitchener had "forgotten himself" and tried to take the socket out of a "live" terminal. The inquest was adjourned until to-day (Friday).

An inquest was held at Enfield on April 28th, on Frederick Bryant, aged 16, who received an electric shock through climbing a pole in a field carrying an overhead line conveying electricity at a pressure of 33,000 V. A boy who was with him stated that Bryant climbed the pole to win a wager. A representative of the North Metropolitan Electric Power Supply Co. said that in addition to a red danger notice the bottom of the pole was protected with barbed wire and a row of spikes. A verdict of accidental death was recorded.

Educational.

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY.—Edmund Mills Harwood Memorial Scholarship.—The Governing Body announces the offer of a scholarship, value £50 per annum for three years, tenable in one of the University engineering courses in the College of Technology. Applications must be forwarded by June 15th. Particulars, &c., from the Registrar of the College.

THE POLYTECHNIC, Regent Street, W.—A special course of six lectures on "Electrical Engineering Economics" will be given by Mr. D. J. Bolton on Thursdays commencing May 10th, from 6.30 to 8.30 p.m. Fee for the course, 7s. 6d. For particulars, apply to the Director of Education. (See our advertisement pages to-day.)

Modern Atlantic Cable Operation.

In the article on this subject in our last issue, an ambiguity occurred in the description of the records reproduced on page 722 (fig. 19). The incoming record is the top one in each of the six triple lines; the drum local relay record is the thin middle line in each of the six; and the outgoing record is the bottom in each of the six. It is the drum local relay record in which the "pick-up" is to be observed, as described in the text.

Institution of Engineers-in-Charge.

The twenty-eighth annual dinner of the Institution of Engineers-in-Charge was held at the Holborn Restaurant, London, on April 27th, when Mr. Loughnan St. Lawrence Pendred, president of the Institution, was in the chair and about 250 members and guests were seated. The first toast of the evening, after the loyal toasts, "The Institution," was proposed by Mr. R. W. Allen, C.B.E., president of the Institution of Mechanical Engineers. He commented on the good feeling that existed between the two Institutions—Mechanicals and Engineers-in-Charge. While men in charge of running plant were not always sympathetic towards the designers, it was a great help to progress for each to see the other's point of view. It was essential for the successful engineer to maintain a balance between his practical and academic training.

Mr. Pendred, in a humorous and pleasing reply, said that the Institution of Engineers-in-Charge was one of the most enterprising of the junior institutions. The quality of the papers read at its meetings was high, and there was "pep" in the discussions. The Institution also took a great interest in the personal welfare of its members, which was not the case with some of the great institutions.

Mr. H. G. Burford, vice-president of the Institution, proposed the toast of "Industrial Research," in which he stressed the bearing of research work on the efforts of the practical man.

In reply, Sir Frank Heath, K.C.B., Department of Scientific and Industrial Research, said that the idea that the object of research was to produce epoch-making events was not the real one. Industrial research was not the work of a few highly-qualified scientists, but of a large body of competent, practical men. Research workers had a definite object, they were not sent out to find out what they pleased. An instance of the value of industrial research was to be found in the results of the work of the British Electrical and Allied Industries Research Association. As the result of the increased permissible capacity for underground cables, £4,000,000 had been added to the value of the existing cables in this country. The income of that Association was only £16,000 per year. Would it be unreasonable to ask the electricity supply undertakings to subscribe that amount? Their contributions did not amount to anything like that figure.

"Our Guests and Friends" was proposed by Mr. S. Carter, to which Mr. W. R. Ormandy responded; and Mr. Henry King proposed "Our President," to which Mr. Pendred replied.

E.A.W. Activities.

On April 24th a party of students from the Battersea Polytechnic visited the model electric kitchen of the Electrical Association for Women; Miss Haslett, director, E.A.W., gave a short address on the "Possible Openings in the Electrical Industry for Trained Women," and Miss Norvick explained the electrical apparatus in the kitchen.

Civil Service Commission.

Examinations are being held for probationary inspectors and probationary assistant engineers in the Engineering Department of the Post Office. Regulations, particulars, and forms of application can be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W.1. (See our advertisement pages to-day.)

Daylight and Artificial Daylight.

A discussion on this subject was opened by Mr. J. S. Dow at the meeting of the Illuminating Engineering Society which was held at the Home Office Industrial Museum on April 24th; Mr. D. R. Wilson (president) was in the chair.

In his introductory remarks, Mr. Dow stated that the light of day was often spoken of as the ideal form of illumination; yet it had grave drawbacks, varying with the time of day and period of the year. Examples were quoted to show that even in a comparatively well-lighted office, the daylight illumination, with unilateral lighting, might vary from 20 foot-candles near the window to 0.01 f.c. at a point remote from the window. Attention was drawn to the contrast-effect of the overhead bright sky, to which the eye became adapted during daylight hours; the author suggested that for this reason higher illuminations were usually required in the daytime than those which seemed adequate at night, by artificial light.

One found differences of opinion with regard to the imitation of daylight. Some people seemed to think that the ideal in artificial lighting was to get as near as possible to daylight; others believed that artificial lighting was something new and that one might legitimately aim at novel effects which were impossible by daylight. Certainly in the theatre and the picture palace the charm of the lighting lay in the departure from ordinary day conditions. Similarly, in the home it was doubtful whether most people would desire to perpetuate daylight after working hours. The subdued mellow effect of artificial lighting formed a natural bridge from the working daylight period to darkness and repose.

There were, however, very many cases in which the illuminating engineer was called upon to supply artificial light as a supplement to daylight. Many offices required artificial light almost continuously during the winter. Shop-windows were now often illuminated during the afternoons before daylight had ceased; in many railway stations it was frequently necessary to use some artificial light during the daytime. It seemed possible that in such cases it would be worth while to try to imitate daylight visually, provided the absorption of light was not, say, more than 25 to 30 per cent. In this connection Mr. Dow described the lighting of the Council Chamber of the Chartered Institute of Secretaries, where the somewhat "cold" effect of the modified artificial daylight used was corrected by the skilful use of warmer tones in the scheme of decoration.

Special consideration was paid to the difficulty of working in a mixed light, which the author suggested was not due entirely to the difference in colour of the light. Two effects which seemed to exercise an important influence were the contrast-effect of the sky, which caused ordinary artificial intensities to appear inadequate, and the psychological effect of the progressive diminution in daylight during the twilight period.

Reference was also made to the debatable question of the comparative effects of natural and artificial light on acuteness of vision. The author suggested that this question was closely associated with the chromatic aberration of the eye, which explained why personal opinions on this point differed. In order to illustrate this point charts containing stencilled letters illuminated respectively by pure red and pure blue light were exhibited. The majority of the audience expressed agreement that the letters illuminated by red light were the more distinct at a distance, though there were some dissentients. At close quarters, in the author's experience, the reverse was the case, with the result that many people found it easier to read for long periods by a light which approached daylight in spectral composition.

Finally, a few words were said on psychological effects, notably on methods of counteracting the "cold" effect of illuminants imitating daylight. It was also suggested that the quality of light most favourable to energetic effort and increased production was not necessarily that most favourable to accuracy.

Following the introductory paper, Capt. E. J. Halstead Hanby exhibited a series of cabinets showing the relative effects of artificial daylight, modified artificial daylight, and uncorrected artificial light, and Dr. S. English explained a new method of securing an imitation of daylight by an addition of blue to the light of a gasfilled lamp, instead of using a blue light-filter.

An interesting discussion ensued, in which Mr. C. C. Paterson, Mr. J. Mackentire, Mr. A. Cunnington, Mr. L. E. Buckell and others took part, and the proceedings terminated with a vote of thanks to author and exhibitors.

"Scialytic" Lighting.

The accompanying illustration depicts the use of the "Scialytic" lighting which has been installed in the Jersey

"Scialytic" Lighting at Jersey Hospital.

General Hospital, St. Helier, by Messrs. G. N. Haden & Sons, Ltd. The object of the system is to obtain an inverted cone of light, without shadow.

Transmission at 220,000 Volts.

The Rhenish-Westphalian Electricity Supply Company, of Essen, in 1925-26 constructed a hollow-cable overhead line for a 220,000-volt working pressure between Cologne and Mannheim. The line is now being extended in a southerly direction, and is to bring about an exchange of power between the Tyrol water-power sources and the power station of the Westphalian Company in Rhineland and Westphalia. The order for the equipment of seven outdoor transformer stations for 220,000 volts was recently given to the Siemens-Schuckert works. Besides the large number of oil switches and transformers, the latter Company is to supply transformers for 1,200,000 h.p.

International Illumination Congress.

Reports are being prepared for presentation at the International Illumination Congress, to be held in September at Saranac Inn, N.Y., U.S.A., on all the important branches of lighting in which investigation is going forward. Among the subjects to be discussed are lighting for aviation; street and highway lighting; store and window lighting as an aid to retail selling; factory, library, hospital and public building illumination; and floodlighting. The foreign delegation will see much of American illumination practice, the tour which is being planned taking in a number of American cities in the eastern half of the United States. Canada is planning to welcome the delegation, which will include Niagara Falls and Toronto in its itinerary; Prof. G. R. Anderson, of the University of Toronto, is preparing for the reception in the Dominion.

Preparations are being made for the Congress under the auspices of the Illuminating Engineering Society and of the U.S. National Committee of the International Commission on Illumination.

Failure of Dam at Los Angeles.

According to the *Electrical World*, the findings of a Commission of six experts appointed by Governor Young, of California, to investigate the cause of failure of the St. Francis Dam in Southern California on March 13th (ELECTRICAL REVIEW, April 20th, p. 693) are embodied in three conclusions in a report filed with the Governor. These conclusions are: (1) Failure of the dam was due to defective foundations; (2) there is nothing in the failure to indicate that the accepted theory of the gravity-type dam is in error; (3) failure of the structure indicates the desirability of having all such structures erected and maintained under supervision and control of State authority. The engineers report that samples of foundation taken from underneath the westerly wall quickly softened and changed to either a mush or a granular mass when immersed in water. "Unfortunately, this material," the report finds, "is of such nature that when entirely dry it is hard and rock-like in appearance and characteristics, although defective in compressive strength. With such a foundation the ultimate failure of this dam was inevitable, unless water could have been kept from reaching the foundation. "Photographic evidence and the testimony of witnesses showed that little seepage passed through the structure of the main dam. Certain cracks developed in the main structure which possibly discharged an unimportant amount of water, not at all unusual in concrete dams. Much more important seepage is reported to have taken place through the foundation upon which the dam rested. As the water rose in the reservoir, this seepage appears to have increased to a maximum of between one and two second-feet on the afternoon preceding the failure. Rumours of muddy water seeping under or around the dam before its failure are in circulation, but the Commission has been unable to verify them." A similar finding was made by a board of engineers and geologists appointed by the Los Angeles District Attorney. This board declared that the dam should never have been built on the site selected.

Institute of Transport.

The seventh Congress of the Institute will be held at Liverpool on May 17th to 19th. The proceedings will comprise the reading and discussion of papers at meetings to be held at the Adelphi Hotel, visits to places of general interest, and inspections of various works, &c. The annual dinner of the North-Western Section will take place at the Adelphi Hotel on May 18th, at 7.15 p.m., when Mr. Cecil Bentham, chairman of the Section, will preside, supported by the Lord Mayor of Liverpool.

Appointments Vacant.

Lady clerk (£3) for the Leyton Corporation Electricity Showroom. Technical assistant (£250) for the Nuneaton Corporation Electricity Department. Supply engineer (Rs. 1,600 per month) for the Bombay Electric Supply and Tramways Co., Ltd. Transmission line engineer (£800 to £900) for Malaya. (See our advertisement pages to-day.

Diesel-Electric Railway Trains.

A new type of train is being tried experimentally by the London, Midland and Scottish Railway Co. A 500-h.p. Beardmore-Diesel engine, consuming crude oil, drives electric generators which energise the traction motors. Two five-coach trains driven in the same way were ordered by the Buenos Aires Great Southern Railway Co. last year. According to *The Times*, the trial train, consisting of four coaches with the power unit contained in the front part of one of them, has been tested privately between Manchester and Blackpool, and is said to have made satisfactory performances with a maximum speed of about 50 miles an hour. Its appearance is that of the electric trains to be seen on London suburban services, and its general equipment, too, is very like that of the ordinary electric train.

B.E.S.A. Publication.

When the British Standard Specification No. 122 on Milling Cutters and Reamers was drawn up and issued in 1920, the Report on British Standard Limits and Fits for Engineering (No. 164-1924) had not been completed, and there had been no opportunity of correlating the reamer limits given in the specification with those for the standard holes. The tolerances for the reamer diameters have now been reconsidered by the Association, and the revised tolerances have been issued as a leaflet for insertion in B.S. Specification No. 122-1920. Copies of the leaflet of revised tolerances for insertion in B.S. Specification No. 122-1920 will be supplied gratis by the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, on receipt of a stamped addressed envelope.

Institution Notes.

Institution of Electrical Engineers.

MERSEY AND NORTH-WESTERN CENTRES.—Owing to the poor response, the proposed week-end reunion of the North-Western Centre and the Mersey and North Wales (Liverpool) Centre in the Lake District has been abandoned. In its stead there will be an excursion into Derbyshire on May 12th by road from Manchester. The D.P. Battery Co.'s works will be visited.

Diesel Engine Users' Association.

At the meeting of the Diesel Engine Users' Association, which was held on May 1st, Mr. M. Gercke, technical advisor to the M.A.N. Co., Germany, read a paper entitled "Some Considerations Regarding the Peak Load Problem and High Power Peak Load Diesel Engines." The author said that in Germany large amounts of electrical energy were transmitted by overhead lines between the northern and southern districts, and exported and imported over political boundaries, and this development had resulted in a high standard of economy and safety in power production. On the other hand, there were some drawbacks and difficulties in power transmission from the technical and economical points of view. These were mainly caused by the long distances of the distribution system, and particularly by the heavy peak load during the winter season, the lack of demand during the summer season, and the loads during the rush hours of the evening, which occurred all the year round. Referring to the reports which have been issued by the Central Electricity Board, and in particular to the proposed scheme for South-East England, the author pointed out that the curves of the total aggregate load might be sub-divided into a three-shift base load of the so-called first order, a two-shift base load of the second order, and a one-shift peak load of the third order. The last-mentioned was characterised by two large sharp peaks of the power demand, lasting only for a short period during five days of the week in the winter season and aggregating a total peak-load time of 500 to 1,100 hours. According to international statistics and the experience of large cities and industrial districts the units generated to cover the base loads of the first and second order amounted to approximately 95 per cent. of the total supply. Owing to the more even distribution over a large period this demand could be met by only 50 per cent. of the power station rating during the peak load period. The peak load consumption actually demanded only some 5 per cent. of the total supply, but it required certainly not less than 50 per cent. of the maximum rating. In the consideration of the economical effect of peak loads on the efficiency of steam power plants there was, in addition to the load factor, another expression which might be considered as a practical standard for judging the generating conditions of power plants from the economical point of view. This was the time factor of the maximum demand, *i.e.*, the number of hours per annum to which the total power production in kWh might be reduced, supposing it were generated with the constant maximum demand. Of course, the higher this theoretical figure the better were the operating conditions, because the power plant would work more favourably with a higher utilisation of its capacity and output. Experience had shown that quick starting of peak boilers or heating up of normal boilers to overload with additional pulverised fuel, oil or gas furnaces could not be regarded as a satisfactory and positive way of settling the peak-load problem. The main advantage of the Diesel engine, which was now available for land use in units of 10,000 kW and upwards individual capacity, was the fact that it was always ready for starting without the necessity for pre-heating or other preliminaries. Furthermore, the loss of fuel before starting and after stopping was avoided.

Junior Institution of Engineers.

Some interesting figures concerning iron and steel furnaces were given by Mr. C. H. Plant in a lecture on "The Manufacture of Structural Steel" on April 27th. Mr. Plant described a modern blast furnace in which the charging operations were carried out electrically from the ground, so that it was unnecessary for men to work at the top. He mentioned also a continuous rolling mill used for rolling rails which was operated electrically under the control of one man, who could manipulate the ingot through the first mill for the proper number of passes, send the steel on to the next mill for further rolling, and then through a third mill for the final rolling of the section.

The annual dinner of the Institution on April 26th, at the Monico Restaurant, Piccadilly Circus, marked the forty-fourth anniversary of its foundation in 1884 by apprentices at the Lambeth works of Messrs. Maudslay, Son & Field, some of

whom are still members of the Institution, and were present at the dinner. At that time it was known as the Vulcan Engineering Society, later as the Institution of Junior Engineers, and finally by its present name, under which it was incorporated in 1905. Of its 1,700 members, over two-thirds are resident in London, the remainder being in the provinces and abroad. There are four active local sections at Birmingham, Manchester, Sheffield, and Newcastle. It has a live *Journal* and a library, which contains over 2,000 volumes. The financial position of the Institution is sound; although it aims at expending practically the whole of its yearly income in giving service to its members, the invested reserve amounts to £3,000.

Following the loyal toast, "The Institution" was proposed by Mr. E. S. C. Trench (president, Inst.C.E.), and Mr. W. M. Hurrell (chairman, J.I.E.) responded. "The Engineering Industry" was proposed by Mr. W. J. Tennant (vice-president, J.I.E.), and replied to by Sir Murdoch MacDonald (president, J.I.E., and chairman of the evening). Mr. S. H. Hole (vice-chairman, J.I.E.) proposed the health of "Our Guests," on whose behalf Brig.-Gen. Magnus Mowat (secretary, I.Mech.E.) and Lt.-Col. J. T. C. Moore-Brabazon (president-elect of the J.I.E.) responded. Finally, on the proposal of Mr. C. E. Atkinson (vice-chairman, J.I.E.), the toast of "The Chairman" was accorded musical honours.

The Physical Society.

At the annual meeting, following the unanimous adoption of the annual reports of the Council and hon. treasurer, the Duddell Memorial Medal for 1928 was presented to Mr. F. E. Smith, C.B., C.B.E., D.Sc., F.R.S., director of research at the Admiralty. Prof. Albert Einstein was elected an Hon. Fellow of the Society, and the following officers were elected for the 1928-29 session:—*President*, Dr. W. H. Eccles; *Vice-presidents*, Mr. R. W Paul, Drs. E. A. Owen, D. Owen, and F. L. Hopwood; *hon. secretaries*, Dr. A. O. Rankine and Mr. J. Guild; *Members of Council*, Miss A. C. Davies, Drs. A. M. Tyndall, A. Ferguson, J. S. G. Thomas, E. V. Appleton, E. N. da C. Andrade, Ezra Griffiths, A. B. Wood, Sir R. Paget, and Mr. T. Smith.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Modern Transport reports that Mr. CHARLES H. ELLISON, telegraph superintendent, North-Eastern Area, L.N.E.R., retired on April 30th, after over fifty years' service. He joined the staff of the former North-Eastern Railway as a learner in the telegraph department in November, 1877. Mr. Ellison was president of the Institution of Railway Signal Engineers from 1921 to 1922. He is a member of the Institution of Electrical Engineers, the Institute of Transport, and the British Engineering Standards Association.

Mr. J. W. HIBBERT, who for the past nine years has been assistant borough electrical engineer at Doncaster, has been recommended for the position of borough electrical engineer in succession to Mr. S. R. Windle, who has been appointed chief at Grimsby.

According to the *Financial Times*, Mr. J. T. BROWNLIE has been re-elected President of the Amalgamated Engineering Union by a clear majority of 4,808.

Sir WILLIAM H. CLARK, K.C.S.I., C.M.G., Comptroller-General of the Department of Overseas Trade, who has held that office for the past ten years, has been appointed High Commissioner in Canada for H.M. Government in Great Britain. He will shortly proceed to Ottawa. He will be succeeded at the D.O.T. in London by Sir Edward F. F. CROWE, C.M.G., who has served as Commercial Counsellor, as Commercial Secretary (Tokio British Embassy), and in the Consular service in the Far East since the year 1897.

Glasgow Corporation Special Sub-Committee on Reorganisation of Electricity Department recommends that, pending the appointment of a new general manager, Mr. GEORGE MORGAN, at present assistant engineer, be authorised to carry on the work of the department, and to undertake the duties falling to be performed by the general manager.

Mr. CHARLES E. HUME, for nearly 20 years engineer and manager to the Ramsgate and District Electric Supply Co., has just retired, and is succeeded by Mr. LEWIS, of Caterham. Mr. Hume joined the staff of Edmundsons' Electricity Corporation, Ltd., in 1903, and went to Ramsgate from the Twickenham and Teddington Electric Supply Co. Prior to that he was on the Bristol Corporation staff.

The Liverpool Corporation Tramways and Electric Power and Lighting Committee recommends the City Council to increase the salary of Mr. P. PRIESTLY, the tramway manager, from £1,600 to £1,800 per annum.

Signor GUIDO SEMENZA, General President of the Italian Association of Electrical Engineers, has recently been appointed an Officer of the French Legion of Honour, as a mark of appreciation of his work as Italian Commissioner at the Hydro-Electric Exhibition at Grenoble in 1925.

Mr. C. E. ALLSOPP, sales manager to the Bradford Corporation Electricity Department, became critically ill on April 21st and underwent an operation two days later. We are glad to learn that he is now progressing satisfactorily towards recovery.

Following upon the resignations of Messrs. H. DU CROS, W. DU CROS, H. GUEDALLA, J. H. GUY, and J. D. WATSON, from the board of the Hoffmann Manufacturing Co., Ltd., in view of the control of the company having been acquired by Messrs. Brown Bayley's, the following new directors have been appointed: Messrs. R. ARMITAGE (chairman), W. J. ARMITAGE, H. BREARLEY, Lord ERNEST HAMILTON, and Mr. M. R. MAINPRICE. The new directors, with the addition of the remaining directors, namely, Messrs. A. O. PEACH, P. C. LOW, and E. S. SPYER, and Messrs. T. W. COOPER, and F. C. PRYKE (joint managing directors), constitute the new board.

Obituary.—MR. ERNEST HATTON.—We regret to record that Mr. Ernest Hatton, who for more than thirty years had been very prominently connected with electric tramway work in this country, has passed away after prolonged illness due to heart disease. He died at his home at Benton, Newcastle-on-Tyne, on Thursday last week. During the period mentioned above he had been responsible for the laying of the Liverpool tramway system as quite a young man of about 23 years of age. Later he was engaged in similar work at Birkenhead and Salford, but his important work began at Newcastle-on-Tyne in 1905, when he took over the position of general manager and engineer of the Corporation tramway system and power station, which provided electricity for public lighting as well as for the tramway service. From the first he made a marked impression on the system, the work of improvement extending over a considerable period. He is described as one of the most fearless and competent of public officials in the country. He tendered his resignation in 1922, but was prevailed upon to withdraw it and to take a holiday, but two years ago he again had to ask relief from increasing responsibilities, and on medical advice definitely severed his connection with the municipal service, except in an advisory capacity.

MR. G. H. ROBERTS.—We record with regret that Mr. G. H. Roberts, who rose from very humble circumstances to be Minister of Labour and Food Controller in the British Government, passed away from heart failure on April 25th at Sevenoaks, at the age of 58 years. Mr. Roberts first came closely into touch with the engineering world during the war, and used his influence and experience gained as an organiser in the labour world for the purpose of bringing about more peaceful conditions in productive works during the very critical periods of the war. He was connected with one of the Industrial Leagues. He gradually left the Labour Party. In addition to the very heavy duties that devolved upon him in connection with the Food Controllership he became connected with a number of electrical and other companies as director. At the time of his death he was either chairman or director of nine companies, including several interested in the home beet-sugar industry.

MR. D. ROBERTS.—Mr. David Roberts, whose death was briefly referred to in our last issue, commenced his engineering career in 1873 with the Hydraulic Engineering Company, Limited, of Chester, and remained with it for 15 years. In 1888 he entered the employ of Armstrong, Mitchell, Ltd. remaining for eight years. Being convinced of the immense future development of the oil engine, the manufacture of which had just been taken up by Richard Hornsby & Sons, Ltd., of Grantham, he accepted in 1895 the position of works manager to that company. Owing to the success of the business under his management, due to his expert knowledge of works organisation, he was promoted to the position of general manager, and in 1904 to the post of managing director, which position he held until 1918, when Hornsbys amalgamated with Ruston, Proctor & Co., Ltd., of Lincoln. During the intervening period the business of Richard Hornsby & Sons, Ltd., under his guidance, had been restored to a state of prosperity. In 1905, Mr. Roberts carried through the amalgamation of Hornsbys with the old established firm of J. E. H. Andrews & Co., Ltd., of Reddish, Stockport, the makers of the Stockport gas engines and plants, from that time onwards having the assistance of Mr. A. R. Bellamy, the managing director of Andrews. Upon the amalgamation of Hornsbys with Ruston, Proctor, and Company, Ltd., the name of the company was changed to Ruston and

Hornsby, Ltd. Mr. Roberts was appointed a joint managing director of the new company, from which position he retired in 1920, remaining, however, on the board as an ordinary director. Mr. Roberts was also the inventor of boilers of the water-tube type.

Mr. G. D. Killey.—Mr. George Deane Killey, a director of the Liverpool Overhead Railway Co., and formerly chairman of that company, died at his home at Waterloo, near Liverpool, on Saturday last. He was 74 years of age.

Mr. C. Anderson.—News has been received on Tyneside that Mr. Charles Anderson, formerly a partner in the firm of Messrs. Anderson & Co., electrical engineers, of Gosforth, has succumbed in East Rand, Transvaal, as the result of a motoring smash. Deceased, who was only 27 years of age, took up an important position two and a-half years ago with the Langlaagte Estate Gold Mining Co., Ltd., in South Africa.

Will.—Mr. L. C. Vernier left £11,071 gross and £9,204 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Electric Hare Engineering Co., Ltd.—Registered as a private company April 26th. Nominal capital, £100 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, &c., to lay down, fix and carry out all necessary wire, lines, accumulators and works for the purpose of working and running electric "hares." The subscribers (each with one share) are:—H. B. Slaughter, 106, Monega Road, Forest Gate, E.7, commercial clerk; P. A. W. Dunn, 22, Cambrian Road, Richmond, Surrey, solicitor's managing clerk. The first directors are to be appointed by the subscribers. Registered office: 27, Chancery Lane, W.C.2.

Universal and General Radio Co., Ltd.—Private company. Registered April 30th. Capital, £32,500 in 24,000 8 per cent. cumulative preference shares of 10s. each and 20,500 ordinary shares of £1 each. Objects:—To acquire from the Triumph Trust, Ltd., First Co-operative Investment Trust, Ltd., and Second Co-operative Investment Trust, Ltd., certain property and assets, and to carry on the business of manufacturers, importers and exporters of, agents for and dealers in apparatus, equipment and accessories for telegraphy or telephony, or wireless-telegraphy or telephony, pianofortes, piano players, gramophones, &c. The first directors are:—E. Martin, The Haven, Chesham Bois (managing director, Triumph Trust, Ltd.); P. H. Brashier, 17, Udney Park Road, Teddington, Middlesex; H. Defries, 186, Willesden Lane, N.W.6; M. Seelig, 40, Kingswood Avenue, Brondesbury Park, N.W.6. Registered office: 42a, Bravington Road, W.9.

Alpine Sun Ray Treatments, Ltd.—Private company. Registered April 27th. Capital, £100 in £1 shares. Objects:—To establish and conduct sunlight or ultra-violet ray and other surgical, dental and medical clinics, &c. The permanent directors are:—Lt.-Col. G. S. Hutchison, D.S.O., M.C., The Old Gardens, Hillingdon, Middlesex; Hans F. E. Aderholdt, 24, Belsize Grove, N.W.; A. T. K. Moir, 46, Wisteria Road, Lewisham, S.E.13; L. L. Hudson, 38, Elm Park Gardens, Chelsea, S.W.3. Registered office: 67a, Baker Street, W.1.

Induction Motors (London), Ltd.—Private company. Registered April 26th. Capital, £1,500 in £1 shares (1,000 ordinary and 500 7½ per cent. cumulative preference). Objects: To carry on the business of general electrical and mechanical engineers, merchants and factors, dealers in electrical appliances, and materials of all kinds, motor manufacturers, &c. The permanent directors are:—J. S. Cotman and H. C. Bristow, addresses not stated; P. F. Brittain, 110, Cannon Street, E.C.4; J. J. Henderson, 4, King Street, Cheapside, E.C.2. Registered office: 110, Cannon Street, E.C.4.

Money Hicks, Ltd.—Private company. Registered April 24th. Capital, £500 in 475 10 per cent. cumulative preference shares of £1 and 500 ordinary shares of 1s. each. Objects:—To carry on the business of manufacturers of, and dealers in, electrical photographic, and scientific apparatus and materials, metal workers, makers of fancy goods of all kinds, &c. The permanent directors are:—A. F. Money Hicks, company director; and Mrs. G. Hicks, 54, Britannia Road, Walham Green, S.W.6. Registered office: 54, Brittannia Road, S.W.6.

F.E. Industrials, Ltd.—Private company. Registered in Edinburgh on April 25th. Capital, £10,000 in £1 shares. Objects: To carry on the business of distributors of and dealers in all kinds of electrical goods, manufacturers, commission agents, merchants, warehousemen, &c. The subscribers (each with one share) are:—R. Logan, Knocknair, Kilbernie, retired school teacher; D. J. Aitken, 144, West Regent Street, Glasgow, solicitor; D. Rankine, 238, West George Street, Glasgow, mining engineer; J. McConnell, 79, West Regent Street, Glasgow, accountant; J. E. Lang, 20, Bridge Street, Glasgow, house factor. The first directors are not named. Solicitors: D. Jeffrey Aitken & Co., 144, West Regent Street, Glasgow.

Electric and Ordnance Accessories Co., Ltd.—Registered as a private company, April 23rd. Nominal capital, £50,000 in £1 shares. The objects are to acquire from Taylor, Tunnicliff and Co., Ltd., for £65,000 (payable as to part thereof by the allotment to the said Taylor, Tunnicliff & Co., Ltd., of 45,000 ordinary shares in Electric and Ordnance Accessories Co., Ltd., and as to the balance by the issue to the Broadway Finance and Investment Co., Ltd., or its nominees, of a debenture for £20,000), the property, undertaking, goodwill, machinery, plant and other articles comprised in an agreement for sale dated February 28th, 1928, and made between Electric and Ordnance Accessories Co., Ltd. (which has since changed its name to that of Broadway Finance & Investment Co., Ltd.) of the one part, and the said Taylor, Tunnicliff & Co., Ltd., of the other part, and to carry on the business of manufacturers of refractory materials of all kinds, potters, and manufacturers of electrical porcelain, china, stoneware, earthenware and flint, stone and colour grinders, &c. The first directors are:—A. E. Wilbraham, Princes Road, Hartshill, Stoke-on-Trent; P. Cooper, "Armadale," Blythe Bridge, Staffs.; W. J. Kent, Tittensor Cottage, Tittensor, Staffs.; E. Browning, 11, Lord Street, Basford, Stoke-on-Trent. So long as Taylor, Tunnicliff & Co., Ltd., hold £25,000 shares, they may appoint three directors. The first three of these directors are the first nominees. Qualification of directors, £100 shares. Secretary: A. E. Wilbraham. Office: Broad Street, Shelton, Stoke-on-Trent.

Nutter, Son & Edge, Ltd.—Private company. Registered April 25th. Capital, £5,000 in £1 shares. Objects: To acquire the business of an electrical and general merchant and agent now carried on by P. Nutter at 41, Side, Newcastle-on-Tyne, as "P. Nutter & Son." The permanent directors are:—J. C. Edge, Hollywood, Smithills, Bolton, Lancs.; P. Nutter, 4, Nately Avenue, East Boldon, Durham. Qualification, £100 shares. Secretary: J. C. Edge.

Official Returns of Electrical Companies.

British Wolmerth "Sanawaves" Co., Ltd.—Capital, £5,500 in 5,000 preference shares of £1 each and 10,000 ordinary shares of 1s. each. Return dated October 15th, 1927 (filed March 15th, 1928). Three preference shares taken up. £3 paid. Mortgages and charges, nil.

Simmonds & Stokes, Ltd.—Issue on April 12th, 1928, of £350 second debentures, part of second series already registered. Particulars also filed of £3,000 second debentures (third series) authorised February 22nd, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

H. & S. W. Thomas Co., Ltd.—Trust deed dated March 29th, 1928, to secure first mortgage debentures for £4,000, charged on freehold premises known as Delphi Garage, Tenby, and lease of electric light and power station, at Saundersfoot, Pembrokeshire, and the company's undertaking and property, present and future, including uncalled capital. Trustees: A. C. Lancaster, 2, Rock Terrace, Tenby; and E. J. Head, 1, St. Catherine Terrace, Tenby.

Hartley Engineering Co., Ltd.—Issue on March 23rd, 1928, of £200 debentures, part of a series already registered.

Dorset and Devon Electricity Supply, Ltd.—F. P. Barnes, 24, Coleman Street, E.C., was appointed receiver and manager on March 24th, 1928, under powers contained in debenture dated August 16th, 1927.

Midget Lamp Co. (1924), Ltd.—Capital, £2,000 in £1 shares. Return dated November 30th, 1927 (filed March 9th, 1928). All shares taken up. £2,000 paid. Mortgages and charges, £500.

Barrett & Morris, Ltd.—Capital, £100 in £1 shares. Return dated July 26th, 1927 (filed March 13th, 1928). 100 shares taken up. £2 paid. £98 considered as paid. Mortgages and charges nil.

Rubon, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1927 (filed February 22nd, 1928). Two shares taken up. Nil paid. Mortgages and charges, £500.

Johnson & Murrell Electric Co., Ltd.—Capital, £5,000 in 1,000 preference and 4,000 ordinary shares of £1 each. Return dated December 31st, 1927 (filed February 28th, 1928). 1,000 preference and 2,200 ordinary shares taken up. £1,700 paid. £1,500 considered as paid. Mortgages and charges, nil.

Ward Services, Ltd.—Capital, £5,000 in £1 shares. Return dated May 29th, 1927 (filed March 22nd, 1928). 750 shares taken up. £652 paid. £98 considered as paid. Mortgages and charges, £1,200.

Electric Services (Liverpool), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1927 (filed March 13th, 1928). 152 shares taken up. £152 paid. Mortgages and charges, nil.

Britain's Best Crystal, Ltd.—Capital, £100 in £1 shares. Return dated November 4th, 1927 (filed February 25th, 1928). All shares taken up. £100 paid. Mortgages and charges, nil.

Atmos Electrical Co., Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1 each. Return dated September 12th, 1927. 750 ordinary shares taken up. £750 paid. Mortgages and charges, nil.

Cark & District Electricity Co., Ltd.—Capital, £1,500 in £1 shares. Return dated March 5th, 1928. All shares taken up. £1,000 paid. £500 considered as paid. Mortgages and charges, £2,000 debentures.

Wells, Rayner & Co. (1919), Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1926 (filed February 20th, 1928). 558 shares taken up. £558 paid. Mortgages and charges, nil.

Ventimotors, Ltd.—Capital, £8,000 in £1 shares. Return dated March 14th, 1928. All shares taken up. £8,000 paid. Mortgages and charges, nil.

E. S. White & Co., Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1 each. Return dated August 25th, 1927 (filed March 19th, 1928). 600 preference and 500 ordinary shares taken up. £104 paid, £996 considered as paid. Mortgages and charges, nil.

Consolidated Signal Co., Ltd.—Capital, £425,000 in 220,000 preference and 205,000 ordinary shares of £1 each. Return dated March 1st, 1928. 214,195 preference and 150,548 ordinary shares taken up. £52,839 paid on 24,999 preference and 27,840 ordinary shares, £311,904 considered as paid on 189,196 preference and 122,706 ordinary shares. Mortgages and charges, nil.

Reason Manufacturing Co., Ltd.—Capital, £52.500 in 200,000 preference and 10,000 ordinary shares of 5s. each. Return dated December 27th, 1927. 92,000 preference and 10,000 ordinary shares taken up. £2,349 5s. paid on 9,397 preference shares, £23,150 15s. considered as paid on 82,603 preference and 10,000 ordinary shares. Mortgages and charges: £11,000.

Waltham Radio, Ltd.—Capital, £1,000 in £1 shares. Return dated March 26th, 1928. All shares taken up. £1,000 considered as paid. Mortgages and charges: £500 debentures.

East Anglian Electric Supply Co., Ltd.—Satisfaction in full on December 31st, 1927, of debentures covered by trust deed dated October 23rd, 1925, securing £20,000. (Notice filed April 23rd, 1928.)

Radiax, Ltd.—F. H. C. Christmas, 46-47, London Wall, E.C.2, was appointed receiver on April 14th, 1928, under powers contained in debentures dated October 7th, 1926.

Fors Accumulator Foreign Patents, Ltd.—Capital, £3,000 in 952 preferred and 2,048 ordinary shares of £1 each. Return dated January 17th (filed December 15th), 1927. 584 preferred and 2,048 ordinary shares taken up. £132 paid, £2,500 considered as paid. Mortgages and charges: £125.

C. B. King (Magnetos), Ltd.—Capital. £1,000 in £1 shares. Return dated December 31st, 1927 (filed March 8th, 1928). All shares taken up. £1,000 paid. Mortgages and charges, nil.

Surrey Wholesale Electrical Co., Ltd.—Capital, £1,000 in 500 "A" shares of £1 each and 10,000 "B" shares of 1s. each. Return dated December 29th, 1927 (filed March 7th, 1928). 451 "A" and 8,600 "B" shares taken up. £275 paid, £600 considered as paid. £6 in arrears. Mortgages and charges, nil.

Westminster Electric Supply Corporation, Ltd.—Capital, £2,000,000 in 550,000 4½ per cent. cumulative preference and 1,450,000 ordinary shares of £1 each. 550,000 preference and 1,259,366 ordinary shares taken up. £1,305,620 paid on 550,000 preference and 755,620 ordinary shares, £503,746 considered as paid on 503,746 ordinary shares. Mortgages and charges, nil.

Dver & Young, Ltd.—Capital, £10,000 in 5,000 preference and 5,000 ordinary shares of £1 each. Return dated December 2nd, 1927. 2,975 preference and 3,250 ordinary shares taken up. £2,975 paid, £3,250 considered as paid. Mortgages and charges, nil.

Bury Lighting and Heating Co., Ltd.—Capital. £1,000 in £1 shares. Return dated December 31st, 1927 (filed March 3rd, 1928). All shares taken up. 18s. per share called up. £870 paid, leaving £30 in arrears. Mortgages and charges, nil.

City Notes.

South Wales Power Co., Ltd.

Mr. W. North Lewis (chairman) presided at the annual meeting on April 27th, and in presenting the report and accounts (*vide* ELEC. REV., April 20th, p. 696), said that the increase in the profit of the Parliamentary Company had enabled it to pay its preference dividend and to transfer £10,516 to the limited company, against *nil* for the preceding year. At the last meeting he had expressed the hope that conditions would so improve as to permit of the payment of an ordinary dividend. Although the results had been satisfactory they had not quite reached that point but they were appreciably nearer to it. The output had fallen short of anticipations; it was only 71 million kWh instead of 77 million, but that was considered satisfactory in view of the state of industry. The revenue from the electric lighting areas had increased by 28 per cent., the power revenue by 2¼ per cent., and the total by 5 per cent. Against that the costs of generation had been reduced by 39 per cent. Local rates, however, had increased by 31 per cent. The mains had been increased in length by about 10 per cent. The principal extensions during 1927 included a bulk supply to the Barry Urban District Council, which was expected to begin in a few months; a supply to Dinas Powis; a contract for reciprocal supplies with the Penarth Electric Lighting Co.; bulk supplies to Creigiau, Bedwas and Machen, and Mynyddislwyn; and new retail supplies under Orders to Cowbridge and Pencoed, Llantrisant and Llanfrecha Upper. An order for an additional 25,000-kW set had been placed, and it might be ready towards the end of this year or the beginning of next. He felt confident that the depression in South Wales industry was a passing phase; there were indications that the worst was past and that a gradual return to better conditions could be looked for. The Budget proposals would materially assist South Wales trade. The company was developing the use of electricity by the general public and it was hoped that the gradual relaxation of restrictions upon overhead lines would cheapen distribution. In conclusion, Mr. Lewis mentioned the appointment of Mr. J. W. Beauchamp as engineer and general manager in succession to Mr. W. A. Chamen, and the appointment of the latter to the board.

Urban Electric Supply Co., Ltd.

The net profit for the year ended December 31st, 1927, after provision has been made for debenture interest, income tax, &c., is £98,749, as compared with £90,171 in 1926. To this is added £19,548 brought forward, making £118,297. Deducting the interim dividends and a small sum devoted to the purchase of funded dividend certificates, there remains £100,569. From this £35,000 is put to depreciation reserve, £20,000 to general reserve, and £2,000 to staff benevolent fund. The final ordinary dividend is 4 per cent., making 7 per cent. for the year (as for 1926), £1,250 is used for the purchase of further certificates, and £22,219 is carried forward. During the year the Walton Urban District Council purchased the local undertaking and the proceeds of the sale (£91,087) have been applied to the redemption of 4½ per cent. first mortgage debenture stock. The Glossop, and Camborne and Redruth tramways have been abandoned, and the expenditure upon them has been written off against the capital reserve. The report records the death of Mr. F. E. Gripper and the appointment of Mr. P. F. Tuckett to the board. After the annual meeting on May 10th, an extraordinary meeting is to be held to consider resolutions altering the articles of association and providing for the raising of the capital to £800,000 by the capitalisation and issue of £160,000 of the reserve. In a letter circulated with the report it is recalled that in 1912 £2 was written off each £5 ordinary share, and these shares were later each divided into three shares of £1 each. The object of the present proposals is to restore this £2 by giving the holders of the shares two new ones for each three held.

Johnson & Phillips, Ltd.

The directors' report for the year ended December 31st, 1927, shows that after providing for bad debts, maintenance, &c., the profit was £108,858, as compared with £115,114 for 1926. A net balance of £82,475 brought forward is added, making £191,333. After providing for debenture interest, depreciation, interim dividend, &c., there remains a balance of £115,072. From this it is proposed to pay a final dividend of 5 per cent., making 10 per cent. for the year, as compared with 12½ per cent. for 1926; this will leave a balance of £85,072 to be carried forward. Mr. G. Leslie Wates has been appointed an additional director. Mr. Claude Johnson has retired from the chairmanship and is succeeded by Mr. John Macgregor, who, as mentioned in a special article appearing elsewhere in this issue, is retaining the appointment of managing director. The annual meeting was to be held yesterday (Thursday).

Brush Electrical Engineering Co., Ltd.

The directors recommended a dividend of 10 per cent. for the past year, as for 1926. The surplus amounts to £10,764, of which £8,941 will be distributed under the co-partnership scheme.

Coventry Chain Co., Ltd.

An interim dividend of 3 per cent. (against 2 per cent.) has been declared on the ordinary shares.

Shanghai Electric Construction Co., Ltd.

The profit for 1927 was £96,571, and £30,739 was brought in, making £127,310. There is put to renewals £40,000; to taxation £4,000; to reserve £10,000; to Shanghai staff provident fund, £1,654; leaving available for dividends £71,656. The total dividend for the year is 12 per cent., less tax, leaving £11,656 to be carried forward. The operating profit was £111,541, as compared with £122,817 for the preceding year. During five months labour troubles caused the tramway and trolley-'bus services to be wholly or partially suspended. Conditions have been more favourable during the current year, and the operating profits for the first three months show a satisfactory increase.

It was intimated in the last report that the profits of the Singapore Traction Co., Ltd., would undergo a reduction in consequence of certain unfavourable factors. Far more serious than these was a boycott of the trolley-'buses by a section of the Chinese population, the effects of which were felt until the close of the year, and reduced profits to a point at which nothing was available for division among the shareholders, nor for the Shanghai company as managers. Except for two miles in an outlying district, and a short length of route in the central area, the whole of the routes authorised by the Traction Ordinance is in operation, and 75 trolley-'buses are running. Traffic receipts for the current financial year show a satisfactory tendency.

British Thomson-Houston Co., Ltd.

In their report (which was briefly mentioned last week) the directors record with great regret the resignation of Mr. Edgar A. Carolan, who had been a member of the board since 1902. The expenditure for additions to buildings and machinery were £103,808 during 1927. The profits for the year, after deducting all expenses and charges other than interest on debentures and loans, were £462,444, plus £226,468 brought forward, making £688,912, less interest on debentures and loans £179,759, leaving £509,153. Of this amount the directors recommend that there be appropriated for depreciation, &c., £159,640, and that there be added to the general reserve account £35,000, making £314,513. The dividends paid on the preference shares at the rate of 7 per cent. per annum, less income tax, amount to £84,000, but the directors regret that they are unable to recommend the payment of a dividend on the ordinary shares, and therefore the amount to be carried to the new account is £230,513.

"While the results for the year under review are better than those for 1926, competition at home and abroad has kept prices at unreasonably low levels, and it is only because of an increased factory output that the improvement was possible. The profits remain inadequate and unsatisfactory. Preliminary arrangements have been made with other manufacturing companies, which will be proceeded with as rapidly as possible, with the view of avoiding duplication of effort and unnecessary expenditure, and of effecting economies in various directions, particularly in connection with research, engineering development, manufacturing processes and the purchase of materials. It is with pleasure we record that these arrangements are progressing satisfactorily. As stated in the last report, the amount in the balance sheet under the head of loans comprises advances from one of our associated interests for the purpose of completing works under construction and the financing of extensions of the company's activities."

Redemption has been duly effected of the amounts required on the respective trust deeds in respect of the 4½ per cent. and 7 per cent. debentures.

The proper proportion of discounts, commission, &c., on the issue of 7 per cent. mortgage debenture stock was written off during the year. Messrs. E. A. Baldwin, J. Gray, and J. L. Wilson have been appointed directors since the last general meeting.

The annual meeting was held on Wednesday last. In the course of his speech (with which we shall deal fully in our next issue), Mr. H. C. Levis (chairman) said that arrangements had been made with the Metropolitan-Vickers Electrical Co., Ltd., which were expected to lead to the elimination of unnecessary duplication of effort and expenditure. Progress had been made in a similar direction with the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd.

Madras Electric Tramways (1904), Ltd.

The gross profit for 1927 was £15,197. After meeting interest and London office expenses, and putting £5,000 to depreciation and renewal account, the balance was £1,025, plus £7,166 brought forward. The preference dividend, less tax, absorbed £6,000, leaving £2,191 to be carried forward. Continued motor-'bus competition caused an all-round reduction in fares. The motor-'buses in consequence were run at a considerable loss, and the service was entirely discontinued from December 16th. Additional cars were put into service on the tramways, and the net revenue improved. Owing to pressure of engagements Mr. James Gray has retired from the chairmanship, but he remains on the board. Mr. J. G. B. Stone is now chairman.

Hopkinsons, Ltd.

Speaking at the annual meeting on April 27th, Mr. R. A. Hopkinson (chairman and managing director) said that the amount of orders in hand was greater than they had experienced for a long time. They also had further contracts in prospect, both for home and for overseas. During the past year their foreign trade had been slightly above the average proportion. Mr. Hopkinson said that although they were generally known as valve makers, they had many other departments. He referred to the company's mine-signalling apparatus and electrically-operated valves. They had entered into an agreement with Empson Centrifugals, Ltd., to manufacture and sell that company's centrifugal liquid separators, for which they anticipated a large demand. He had been asked whether the new Electricity Act would make any difference to the company. His reply was that, as the company had already supplied boiler mountings and valves to 98 per cent. of the electricity works of this country, they had reason to believe that they would get their fair share of the orders which would be placed in connection with the new "super stations." They had already supplied, or had in hand, boiler mountings and valves for those stations which had already been erected or commenced.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted:—

American Telephone and Telegraph Company.—$8,017,900 capital stock.

Newcastle-upon-Tyne Electric Supply.—770,000 ordinary shares of £1 each, fully paid, Nos. 2,312,682 to 3,082,681; and 500 5 per cent. preference (non-cumulative) shares of £1 each, fully paid, Nos. 1,532,018 to 1,532,517.

Pinchin, Johnson & Co.—203,750 ordinary shares of £1 each, fully paid, Nos. 645,001 to 848,750.

Stewarts & Lloyds.—59,000 deferred shares of £1 each, fully paid, Nos. 4,074,710 to 4,133,709.

Underground Electric Railways of London.—16,130 ordinary shares of £1 each, fully paid, Nos. 5,089,868 to 5,105,997.

Dealings in the following have been specially allowed by the Committee of the Stock Exchange under rule 159:—

Underground Electric Railways Co. of London, Ltd.—42,755 ordinary shares of £1 each fully paid, Nos. 5,105,998 to 5,148,752.

Barcelona Traction, Light and Power Co.

The gross revenue for the year ended December 31st, 1927, was $4,765,521, as compared with $4,030,089 in 1926, and the net revenue rose from $1,783,882 to $2,548,101. The last amount has been applied to the payment of the dividend on the 7 per cent. preference shares, together with an extra 1 per cent. for participating rights, and an interim dividend of 1 per cent. on the ordinary shares, leaving a balance of $389,004. To this is added $214,695 brought forward, making $603,699. A final dividend of 1 per cent. is being paid on the ordinary shares and a corresponding additional dividend of 1 per cent. on the preference shares, leaving $208,140 to be carried forward.

Ever-Ready Co. (Great Britain), Ltd.

The directors recommend the payment of the following final dividends for the year ended March 31st:—On the preference shares 5 per cent., making the maximum of 10 per cent. for the year; on the ordinary shares 25 per cent., making 35 per cent. for the year, as for 1926-27. The accounts show, subject to completion of audit, a net profit of £187,964, as compared with £174,500 last year. Reserves and carry forward amount to £255,000, as compared with £216,000 last year. The directors propose that each of the ordinary shares of £1 shall be divided into four shares of 5s. each.

British Columbia Electric Railway Co., Ltd.

It was announced last week that the three groups who had made bids for the control of the company, by the acquisition of the preferred and deferred ordinary shares, had made a joint offer. The terms are £275 per cent. for the preferred ordinary and £315 per cent. for the deferred ordinary. The original offer was £240 per cent. for the preferred and £280 for the deferred. Thus the total amount involved in the acquisition of shares of the face value of £3,847,000, has risen from £10,187,500 to £11,533,000.

Metropolitan Carriage, Wagon and Finance Co., Ltd.

It is announced that the following have resigned from the board of directors: Sir E. Wyldbore Smith (chairman), Mr. Bernard F. C. Docker (deputy-chairman), Mr. Ludford C. Docker (vice-chairman), Sir Lingard Goulding, Major J. R. Greg, Messrs. J. T. Sanderson, M. B. U. Dewar, and Mr. B. H. Binder. Messrs. J. P. Crouch, G. G. Sim, R. C. Irwin, and H. Williams have been appointed to the board.

Bournemouth and Poole Electricity Supply Co., Ltd.

The balance available from the past year's working is £169,450 (including £9,376 brought forward). The depreciation and renewals reserve receives £35,000, the taxation reserve £5,000, and the general reserve £60,000. A final dividend of 10½ per cent. is declared on the ordinary shares, making 15 per cent. for the year, and £7,290 is carried forward. The sales of energy rose from 10,656,342 kWh to 12,237,993 kWh. Negotiations are proceedings with the local authorities with regard to the extension of the company's tenure. The report records the death of Mr. R. P. Sellon and the appointment of Mr. R. B. Renwick to the board. At the meeting on May 10th the shareholders will be asked to sanction the creation of 500,000 new shares of £1 each for distribution as a bonus to the ordinary shareholders to be paid up from the reserves.

Rhondda Tramways Co., Ltd.

The report for 1927 records an increase in the gross revenue from £82,462 to £90,365. There was a net profit of £939, which is set against a deficit of £14,866 brought forward, leaving a debit balance of £13,926 to go forward to the current year's accounts. The number of passengers carried rose from 9,224,303 to 10,796,574, but both this figure and the revenue were considerably below the corresponding figures for 1925.

English Electric Co., Ltd.

The annual meeting was held on April 30th. Mr. W. L. Hichens (chairman) presided, and in the course of his speech he reviewed the history of the company in relation to post-war economic developments, and traced the causes of the losses which had been incurred. He showed, however, that the company was securing many important orders which indicated that the organisation was of the highest order. A full report of the speech will appear in our next issue.

Western Union Telegraph Co.

The gross revenue for the first quarter of the current year was $32,066,325 (against $32,065,195 for January-March, 1927). The total expenses rose from $27,926,636 to $28,273,920, and the net income was reduced from $3,241,093 to $2,893,254.

City of Buenos Ayres Tramways (1904), Ltd.

A dividend of 1s. 3d. per share has been declared in respect of the quarter ended March 31st.

United Water Softeners, Ltd.

A dividend of 2s. per share, free of tax, is recommended out of a profit of £20,977 for 1927.

German Companies.

The *German Cable Works Company*, Berlin, which paid a dividend of 6 per cent. for 1926, announces that no distribution will be made for the past year.

The *Dr. Paul Meyer A.G.*, Berlin, recommends a dividend of 8 per cent. for 1927, as compared with 6 per cent. in the previous year.

The *Hartmann and Braun Company*, Frankfort-on-Main, reports that the production of measuring instruments in 1927 reached the highest level and the turnover was the largest since the establishment of the firm. The net profit increased from 217,000 to 346,000 marks, and the dividend is increased from 8 to 10 per cent. on the ordinary shares.

The *Electrical Undertakings Company*, Berlin, which is an investment concern, reports a normal increase in the consumption of electricity in 1927. The net profits are returned at 6,220,000 marks, as compared with 6,180,000 marks in 1926, and the dividend remains at 10 per cent. The activity of the company abroad was extended last year, and it is intended to establish an organisation for foreign business. It is proposed to raise a loan as well as to increase the share capital by the issue of new shares for 10,000,000 marks.

The *Saxony Works, Light and Power Company* states that the orders booked in 1927 considerably increased, the turnover having advanced by 22 per cent. The net profits rose from 750,000 marks to 1,150,000 marks, and the dividend is 7 per cent. against 6 per cent. As a result of the further growth in the number of orders this year, the undertaking already now has work on hand for most of 1928.

The *Bergmann Electricity Works Company*, Berlin, reports a large increase in orders during 1927. Despite the growth in the turnover the results did not correspond with the expectations associated with the measures of "rationalisation," sale prices being unsatisfactory. A decrease in the general expenses was counterbalanced by increases in wages and salaries and losses due to strikes. Good orders were received by the central station department for generators, conductors, and switching plant. In the turbo-generator branch new types were developed combining greater efficiency, with lower weight. The net profit was 4,480,000 marks, as compared with 3,160,000 marks in 1926; the dividend is 9 per cent., against 8 per cent. The export business did not come up to expectations owing to the growing costs of production, but the company maintained its position. While the prices of electrical products were falling abroad, it was to be feared that German exporters would no longer be able to meet this decline. Worse signs were apparent; already foreign industry, partly supported by export premiums, was succeeding in getting a footing in Germany.

Carmarthen Electric Supply Co., Ltd.

For the year 1927 there was a profit of £2,129, plus £1,012 brought forward, making £3,141 available. £200 is put to depreciation, £200 to capital reserve; the 5 per cent. preference dividend absorbs £252. An interim dividend at 10 per annum for the first half absorbed £711, and a final at the rate of 5 per cent. for the last half takes £723, leaving £1,055 to be carried forward. Mr. J. B. Arthur, presiding at the annual meeting on March 29th, said that they had made substantial progress, generating well over half-a-million units—an increase of £109,659. The charges for domestic heating and cooking were reduced from 2½d. to 1½d. per unit, and the number of units sold for such purposes nearly doubled itself. There was a great future in this respect in their non-industrial town, and they were laying more cables. The speaker went on to refer to the enormous increase in their rating expenses, which naturally prevented reduction in prices.

Belgian Companies.

The *Société la Lampe Belge* reports gross profits of 4,167,000 fr. for 1927. After defraying general expenses the sum of 3,890,000 fr. has been applied to depreciation.

The *Société Belge pour la Fabrication des Câbles et Fils Electriques* records net profits of 2,000,000 fr., permitting of the payment of a dividend of 49.85 fr. per share for 1927.

The *Société Générale Belge d'Entreprises Electriques* reports net profits of 10,000,000 fr. for 1927, as compared with 7,420,000 fr. in the previous year. The old shares will receive a dividend of 70 fr. gross and the new shares one of 35 fr. gross per share.

The *Compagnie Belge d'Exploitations Electriques* states that the gross profit in 1927 was 446,000 fr., as compared with 317,000 fr. in the previous year. The gross dividend on the old shares is about 25 fr. per share.

The *Federation d'Entreprises de Transports et d'Electricité* states that the net profit for 1927 was 1,096,000 fr. against 1,098,000 fr. in 1926. The dividend is at the gross rate of 18.70 fr. per share, as compared with 19 fr. in the previous year.

French Companies.

The *Compagnie du Chemin de Fer Metropolitain de Paris* has decided to pay a dividend at the rate of 35 fr. per share for 1927 out of net profits of 13,802,000 fr.

The *Société des Entreprises Générales Electriques et Industrielles (G. Giraudon)* reports a credit balance for 1927 of 1,953,000 fr.; a dividend of 27.625 fr. per ordinary share is being paid.

The *Société des Forges et Ateliers de Constructions Electriques de Jeumont* reports an increase in the net profit from 12,444,000 fr. in 1926 to 13,620,000 fr. last year, and the dividend is raised from 27.50 fr. to 30 fr. per share.

The *Compagnie Générale d'Electricité*, Paris, records net profits of 25,327,000 fr. for the 18 months ended with December, 1927, as compared with 15,852,000 fr. in the previous normal year of twelve months. It is proposed to maintain the dividend at 14 per cent., as in 1925-26.

Swedish Company.

The *Svenska Ackumulator A.B. Jungner* states that orders and deliveries in 1927 rose above the previous year's level despite keen competition. Including the balance forward, the net profits in 1927 amounted to 280,000 kr., against 251,000 kr. in 1926, and the dividend on the ordinary shares is 9 per cent.

Stocks and Shares.

MONDAY EVENING.

GENERAL conditions in the Stock Exchange markets reflect the animation which has now prevailed for several weeks past. Industrial shares are predominantly active. Sound investment stocks continue to be absorbed readily. The Budget proposals had no particular effect upon prices in the markets with which we deal. The additional tax on petrol was anticipated: there are City men who profess to have had definite hints about it a month ago. Underground Electric Railways income bonds fell six points before the Budget was "broken." The drop was caused by the advance apprehensions, just mentioned, concerning petrol. On the actual statement by the Chancellor of the Exchequer, a further, but slight decline occurred, this being soon recovered. The bonds now stand at 125, and the £1 shares remain at 26s., a considerable volume of business being done in both. A rise of 1 lifted Metropolitans to 71 in sympathy with premature exuberance shown by steam stocks on the Government's promise of rate-relief to industrial districts. Districts moved in the other direction. Prices of prior-charge stocks in this section are mostly higher on the week.

Bournemouth and Poole.

Very lively price-fluctuations followed the declaration of the Bournemouth and Poole Electric dividend. Hopes had been entertained of a bonus accompanying the announcement, and, in the absence of this, the shares dropped from 91s. to 85s. Followed a violent jump to 97s., and, later, reaction to about 90s. Rumours of a bonus, or of the shares being taken over at £5 apiece, led to the recoveries, and an official statement should be out before these notes appear. The final dividend of 10½ per cent. makes 15 per cent. for the year. This is less tax, and it compares with 10 per cent. less tax, plus a tax-free bonus of 4 per cent., in the previous year.

Egham and Staines have also shown no little vitality. The demand for the shares proved so persistent that the price rose from 32s. 6d. to 37s. 6d. within a few hours. Reaction to 36s. was followed by a rise to £2. This applies to the old shares. The new, issued not long since at 25s., are about a shilling below their seniors. Richmond (Surrey) Electrics strengthened to 39s. 3d. on the dividend, mentioned here last week, and County of London Electrics, amidst noticeable excitement, moved up to 41s. The County Company is understood to hold a considerable interest in the Bournemouth and Poole Company.

Provincial Power Companies.

Provincial electrical supply and power descriptions are noticeably good. The long-sighted investor, content with a modest return to-day on his money in exchange for reasonable hopes of advance in his capital, has been steadily clearing the market of these power companies' shares. In spite of new issues, the supply of stock is comparatively small, and the effect of the buying begins to manifest its force. Midland Counties are 3s. higher at 29s.; Clyde Valleys gained 1s. 6d. at 35s.; Lancashire Light & Power are 6d. up at 30s. 6d. Yorkshire Electric new ordinary 4s. paid have hardened to 12s., and the new fully-paid are 32s. Scottish Power new ordinary stand at 1 7/16, the new 6 per cent. preference at 22s. 6d. North Wales Power ordinary are 16s. 6d.

British Columbia Electric.

British Columbia Electric Railway preferred and deferred are both 3 points better, gains that look humdrum against the rises of 25 and 20 in the previous week. The 4½ per cent. debenture is 2 to the good. A combined offer by the three groups that have been running up the prices against each other is now made. For the deferred stock 315 is bid, and for the preferred 275. It may be assumed that these represent finality in the offers which hoisted the prices so dramatically. Brazilian Tractions are 6 points better at 246 ex dividend. Atlas Light & Power new preference changed hands last week at 22s. 4½d.

Wireless and Cable.

Excitement has simmered down in the market for cable stocks. Absence of any references in the Budget to the Government's intentions in regard to amalgamation, or working agreement, with the Beam system, led to mild disappointment. Falls have therefore taken place in Eastern Telegraph stock, and in the shares of the Eastern Extension, Globe and Western companies. Marconis have given a better account of themselves and, after an abrupt spurt of 3s. 9d., to 65s., held 1s. 8d. rise on balance at 63s. 9d. The inquiry that lifted the price was said to come from New York. Canadian Marconis rose to 28s. Marconi 7 per cent. preference eased off to 5, rallying to 5⅛. Radio Corporation of America "A" common shares, of no par value, have been done at 35½ and the "A" preferred at 11⅛—sterling in both cases. Anglo-Portuguese Telephones are a trifle up at 24s. 3d. Pernambuco Telephones keep about 14s. 3d., Bogota Telephones at 32s. 6d., Venezuela Telephones at 24s. 9d. for ordinary and preference alike.

U.S. Influences.

Americans are taking a greater interest than ever they have done before in British securities, from the War Loan and Funding stocks to an increasingly large number of industrials. We do not refer so much to the efforts that American interests have made to acquire control of electrical enterprises in this country, as to the welcome afforded by New York houses to shares in well-known British industrial undertakings. The "listing," as it is called, of shares in Wall Street is a kind of official prelude to dealings, in those shares, across the Atlantic. This introduces a fresh element of buying interest, and, to that extent, is beneficial to prices. Rumour flirts constantly with the names of possible shares in which New York may start to deal, and it is not surprising that the large electrical power companies should be mentioned in this connection. For the United States investor is familiar with utility undertakings, and therefore he may be the more tempted to regard favourably the shares of the British concerns. Some people are anything but pleased with the idea of British industrial shares becoming listed in New York, and others fear lest too much American interest might mean the risk of control passing from one side of the ocean to the other.

Manufacturing Shares.

Johnson & Phillips are flat on a final dividend of 5 per cent., making 10 per cent. for the year. This goes against 12½ per cent. for 1926, when the profit was £115,100, or £6,200 more than that obtained in the year just ended. To go back for one more year, it may be recalled that the profit in 1925 came to £209,900. The yield on the money at the present price of the shares is a little over 4½ per cent. Siemens went back to 28s. On the other hand, British Aluminiums are harder at 45s. 9d. British Insulated rose to 83s. 9d. Babcock and Wilcox recovered the dividend deducted last week from the price.

Miscellaneous.

Urban Electric shares hold their good rise at 53s. 9d. The company notifies its intention to capitalise £160,000 of reserves, and proposes to issue 2 ordinary shares of £1 each for every 3 shares now held. This will have the practical effect of replacing the amount written off the par value of the £5 shares in 1912.

London Tramway issues continue to attract interest and support, London and Suburban Tractions being up to 11s. 6d. London United debenture gained 3 points, rising to 60. We mentioned last week the cause for this improvement, and hope looks forward to a possible inclusion of the tramway companies in the Underground Electric Railways group. There is a good deal of activity in the market. Indeed, rubber shares are almost the only industrial issues that fail nowadays to attract favourable attention.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	Dividend. 1927.	Price April 30, 1928.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	£1	14†	—	89/6	+2/-	3 2 6
Brompton Ordinary	£1	8¾	—	25/6xd	—	5 9 10
Charing Cross Corporation	£1	8½	8½	26/6	—	5 5 8
do. do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Chelsea	£1	8¾	8¾	26/6	—	5 5 8
City of London	£1	10	10	29/6	—	4 15 0
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Clyde Valley	£1	8	8	35/-	+1/6	4 11 5
County of London	£1	7½	7½	41/-	+2/6	3 14 0
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Edmundsons' Ordinary	£1	10	—	67/6	—	2 19 2
do. 7% Pref.	£1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	£1	11	—	55/-	—	4 0 0
Kensington Ordinary	£1	8	8	26/6	—	5 5 8
Lancs. Light and Power	£1	7½	—	30/6	+6d.	4 18 4
London Electric	£1	8½	8½	25/6	—	5 9 10
do. do. 6% Pref.	£5	6	6	5½	—	5 8 2
Metropolitan	£1	8	9	2½	—	3 12 0
do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Midland Counties	£1	6	6½	29/-	+3/-	4 9 6
Newcastle-on-Tyne Ordinary	£1	5	6	26/3	—	4 11 3
do. 5% Pref.	£1	5	5	19/6	—	5 2 7
do. 7% Pref.	£1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	£10	6	6	10½	—	5 11 7
North Met. Elec. 6% Pref.	£1	6	6	23/-xd	+6d.	5 4 4
St. James' and Pall Mall	£5	8	8	26/6	—	5 5 8
South London	£1	8½	8½	26/6	—	5 5 8
South Metropolitan Pref.	£1	7	7	1¼	—	6 3 0
Urban Ordinary	£1	7	—	53/9	—	2 12 2
do. 6% Pref.	£1	6	6	1⅞xd	—6d.	5 13 0
Westminster Ordinary	£1	8½	8½	26/-	—	5 7 8
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	22/3	+3d.	6 14 10
Yorkshire Elec.	£1	8	8	33/6	—	4 15 7
Home Rails.						
Central London Ord. Assented	Stock	4	4	73	—	5 9 7
Metropolitan	,,	3	3	71	+1	4 4 6
do. District	,,	5½	4	75½	—1	5 6 0
Underground Electric	£1	1½	5	26/-	—	3 17 6
do. do. Income	Bond's	6	6	125	+1	4 15 3
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	98½xd	—	6 1 8
do Def.	,,	1½	1½	24½	—	6 1 10
Automatic Telephone	£1	10	10	45/-	—	4 9 0
Chili Telephone	£5	6	—	7⅜	—	*3 18 2
Eastern Extension	£10	10	10	21½	-½	*4 14 1
Eastern Tel. Ord.	Stock	10	10	212½	—3	*4 14 1
Globe Tel. and T. Ord.	£10	10	10	21½	—½	*4 13 0
do. do. Pref.	£10	6	6	11½	—	5 7 10
Great Northern Tel.	£10	20	—	39	- 1	5 0 0
Indo-European	£5	10	10	40	—	*5 0 0
Marconi	10/-	5	—	63/9	+⅛	0 15 9
Marconi-Marine	£1	8½	12½	47/6xd	+1/3	5 5 2
Oriental Telephone Ord.	£1	12	—	53/9	—	*4 9 3
United R. Plate Tel.	£5	8	8	11⅛	—	*3 11 3
Western Telegraph	£10	10	10	20½	—½	*4 18 9
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	£5	5½	5½	8½	—	7 4 8
do. do. 2nd Pref.	£5	6	6	5⅛	—	7 17 4
do. do. 5% Deb.	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	320	—	... ...
do. do. 8% Pref. Ord.	,,	8	—	124½	—	6 8 6
Brazil Traction	£100	6	7	246xd	+6	*2 17 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	95½	—	5 4 9
do. do. Preferred	,,	6¼	6¼	273	+3	*2 5 9
do. do. Deferred	,,	8	8	313	+3	*2 10 6
do. do. Deb.	,,	4½	4½	84½	+2	5 0 7
London & Sub. Trac. 5% Pref.	£1	Nil	Nil	11/6	—	... ...
London United Tram Deb.	Stock	4	4	60½	+3	6 12 0
Mexico Trams, 5% Bonds	—	5	5	90	+3	5 11 0
Mexican Light Common	£100	Nil	Nil	94½	—4	... ...
do. 7% Pref.	£100	Nil	7	81½xd	—2	8 11 10
do. 1st Bonds	—	5	5	83½	—	5 19 9
Yorkshire (West Riding)	£1	Nil	Nil	7/6	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	£1	13	15	£8/9xd	+1/7	*4 7 3
British Aluminium Ord.	£1	10	10	45/9	+9d.	*4 7 4
British Elec. Transformer Pref.	£1	7	7	18/-xd	—	7 15 7
British Insulated Ord.	£1	15	15	4¼	+⅛	3 11 8
Brush Ord.	£1	10	—	29/-	—	6 17 11
Callenders	£1	15	—	4⅜	—	3 8 2
do. 6½% Pref.	£1	6½	6½	23/-	—	5 9 5
Crompton Parkinson Pref. Ord.	£1	—	—	17/6	—	... ...
Edison-Swan	£1	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 0
Electric Construction	£1	7½	—	27/-	—	5 11 1
Enfield Cable Pref.	£1	7½	7½	26/3	—	5 14 8
English Electric	£1	Nil	Nil	7/6	—	... ...
do. do. Pref.	£1	3	Nil	11/3	—	... ...
Gen. Elec. Pref.	£1	6½	6½	24/-	—	5 8 4
do. Ord.	£1	7½	—	36/-	—	4 3 4
Henley	£1	25	—	5⅜	—	4 9 0
do. 4½% Pref.	£5	4½	4½	4½	—	5 6 0
India-Rubber	£1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	£1	12½	10	43/9	—½	4 11 4
Met.-Vickers Ord.	£1	8	8	30/-	—	4 0 0
do. Pref.	£1	8	8	2⅜	—	6 1 11
Siemens Ord.	£1	7½	—	28/- *	—9d.	5 7 4
Telegraph Construction	£12	10	10	20½	—	*4 10 11

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

The Retirement of Mr. Claude Johnson.

Mr. John Macgregor succeeds him as Chairman of Johnson & Poillips.

AS announced in the annual report of the company which was presented at the meeting held in London yesterday, May 3rd, Mr. Walter Claude Johnson, chairman of the board of directors and one of the founders of Johnson and Phillips, Ltd., and a pioneer of the electrical industry, has retired from the chairmanship of the company owing to failing health.

Mr. Johnson, who was born in 1847, served his apprenticeship with the Vulcan Foundry, Newton-le-Willows. On the completion of his training he joined the engineering staff of the Telegraph Construction and Maintenance Co., of East

Mr. Claude Johnson,
Founder of Johnson & Phillips, Ltd., who has retired at the age of 81 years.

Greenwich, with whom he was engaged in the laying of submarine cables in many parts of the world, and in the design of machinery for cable-laying steamers. In 1875 he entered into partnership with Mr. Samuel Edmund Phillips, and the firm of Johnson & Phillips, Telegraph Engineers, came into being. Their first workshop is still standing at Charlton, a modest one-storey building of brick and corrugated iron, now completely overshadowed, needless to say, by the extensive range of factory and office buildings constituting the present establishment of Johnson & Phillips, Ltd., whose works cover some 15 acres and give employment to between two and three thousand workpeople.

Telegraphy was in 1875, and for several years afterwards, practically the only commercial application of electricity, and the new firm's first business was the manufacture and sale of submarine telegraph cable machinery and stores for cable steamers. The machines and gear by which the early Atlantic and other submarine cables which followed them were laid had naturally been of improvised design, but well-defined principles and requirements were beginning to appear, and it was in connection with such machinery that the firm first ventured upon orders for heavy engineering plant. That their designs were and continue to be successful is amply proved by the long and continuous roll of cable-steamers—the majority, in fact, of the world's cable fleet—whose cable paying-out, picking up and handling machinery has been designed and made at Charlton.

When it became apparent that the electrical industry had more worlds to conquer than that of communication, Mr. Johnson was quick to appreciate the enormous possibilities latent in electric lighting, even in its early and imperfect forms. Improved electric generators were designed by Johnson & Phillips, and were made at Charlton in increasing numbers, throughout the 'eighties and 'nineties, for a time under the direction of the late Dr. Gisbert Kapp. Other well-known men associated with the works at this time were Professors Ayrton and Perry, and Mr. W. B. Esson.

The firm was one of the first to design and manufacture a successful arc lamp. This department was for long under the direction of a famous arc lamp engineer, Mr. James Brockie, and many thousands of the once well-known "Brockie-Pell" arc lamps and other types, were made at Charlton. Numerous arc lamps of the last Brockie-J. & P. design, the well-known "Metroflam" magazine flame arc lamp, are still in service.

Cables and wires were, of course, required for the new application, and the rubber-insulated cable, since so widely used, began to take something like its present form. Mr. Johnson and his cable machinery designers applied themselves to this problem, and special machinery was devised to make the new types of cables, on principles which to this day hold the field.

About 1890 the company laid the first electric lighting main across Southwark Bridge into the City of London. This cable worked at 5,000 volts. The firm were also responsible for the introduction into this country of some of the first alternating current sets used for lighting supply, these being made to Dr. Kapp's designs. Static transformers were first manufactured at the Charlton works about this time.

After lighting came the use of electricity for power, and the rise of the central station; then electric tramways and railways appeared on the scene, and the generation and distribution of electricity were now evidently destined to become the foremost public utility service. From providing wires and cables for interior wiring, the cable industry was called on to provide street mains and services, and feeders for use at increasing pressures. Here the experience of the submarine cable engineer on heavy telegraph cables came effectively into play. Machines were devised by Johnson & Phillips to strand, insulate, lay up, sheath and armour heavy power cables, and so successful were these designs that they have since found world-wide use, and cable machinery made at Charlton is used, not only in the cable works there, but in leading cable works throughout England, France, Germany, Scandinavia, Holland, Belgium, Switzerland, Italy, Austria, Spain, the United States, Canada and Japan.

The firm of Johnson & Phillips, Ltd., was registered as a limited company in 1905. The latest photograph obtainable of Mr. Johnson is one taken, we believe, somewhere about this time and we reproduce it with these notes.

Of late years the company's activities have been concentrated on the distribution side of the industry—the supply and installation of cables and wires, from e.h.p. mains to flexible cords, overhead lines, transformers and switchgear.

Mr. John Macgregor,
the new Chairman, who now celebrates his Jubilee with the Company.

It is an interesting coincidence that Mr. John Macgregor, the new chairman of Johnson & Phillips, Ltd., this year celebrates the jubilee of his connection with the company. Mr. Macgregor, who was educated at Romsey, joined Johnson and Phillips in 1875 as an articled pupil, and has been with the company ever since. On its conversion into a limited company in 1905, Mr. Macgregor was appointed managing director, which position he will continue to hold jointly with his chairmanship. Mr. Macgregor is also a director of Eastwoods, Ltd., Eastwoods Cement, Ltd., and Burndept Wireless, Ltd.

The Electrical Imports of Egypt.

Figures for 1926 and 1927 Compared.

THE following statement, showing the imports of electrical and similar goods into Egypt during the year 1927 is taken from the recently-issued trade statistics. The figures for 1926 are added for purposes of comparison, and notes of any increases or decreases are given :—

	1926. £E	1927. £E	Inc. or dec. £E
Electrical machinery and parts—			
Total	152,000	212,000	+ 60,000
From Great Britain ...	21,000	62,000	+ 41,000
,, United States ...	14,000	14,000	—
,, France	41,000	44,000	+ 3,000
,, Italy	19,000	18,000	− 1,000
,, Switzerland ...	11,000	21,000	+ 10,000
,, Germany	31,000	24,000	− 7,000
Internal combustion engines, stationary—			
Total	425,000	278,000	−147,000
From Great Britain ...	215,000	141,000	− 74,000
,, France	4,000	1,000	− 3,000
,, Italy	12,000	4,000	− 8,000
,, Switzerland ...	55,000	48,000	− 7,000
,, Germany ...	115,000	52,000	− 63,000
Electric lamps—			
Total	40,000	44,000	+ 4,000
From Great Britain ...	2,600	3,000	+ 400
,, Germany	7,000	8,000	+ 1,000
,, France	1,400	600	− 800
,, Holland	16,000	16,000	—
,, Czecho - Slovakia	300	400	+ 100
,, Austria	8,000	8,500	+ 500
Carbon rods for arc lamps—			
Total	600	500	− 100
Electric cars and wagons—			
Total	6,000	26,000	+ 20,000
Telegraph and telephone apparatus, ordinary—			
Total	30,000	20,700	− 9,300
From United Kingdom	11,000	6,000	− 5,000
,, Sweden	18,000	10,000	− 8,000
Total	2,000	3,000	+ 1,000
Radio apparatus—			
Total	2,000	3,000	+ 1,000
Telephone and telegraph parts and fittings—			
Total	70,000	49,500	− 20,500
From United Kingdom	35,000	32,000	− 3,000
,, Sweden	30,000	13,000	− 17,000
Meters, electric, gas and water—			
Total	27,000	16,000	− 11,000
From Great Britain ...	1,000	600	− 400
,, France	14,000	7,700	− 6,300
,, Germany ...	5,000	5,300	+ 300
Electric and gas pendants—			
Total	63,000	58,000	− 5,000
From Great Britain ...	1,400	3,000	+ 1,600
,, France	32,000	33,000	+ 1,000
,, Germany ...	14,000	10,000	− 4,000
,, Italy	10,500	7,000	− 3,500
Electro-medical apparatus—			
Total	16,600	11,600	− 5,000
From Germany ...	8,600	3,700	− 4,900
,, Great Britain ...	2,800	4,800	+ 2,000
Other electrical appliances and batteries—			
Total	53,000	26,000	− 27,000
From Great Britain ...	14,000	3,000	− 11,000
,, France	6,600	4,000	− 2,600
,, Germany ...	15,000	7,000	− 8,000
,, Italy	8,000	6,000	− 2,000
,, United States ...	5,000	4,000	− 1,000
Electric cables, insulated—			
Total	51,000	32,000	− 19,000
From Great Britain ...	3,250	1,700	− 1,550
,, Belgium	9,000	8,600	− 400
,, France	12,000	8,400	− 3,600
,, Germany ...	17,000	11,000	− 6,000
,, Italy	6,000	1,700	− 4,300
Electric wire and cable, armoured—			
Total	40,000	70,000	+ 30,000
From United Kingdom	4,000	24,000	+ 20,000
,, Belgium	4,000	2,700	− 1,300
,, France	16,000	28,000	+ 12,000
,, Germany	15,000	12,000	− 3,000
,, Italy	2,000	3,000	+ 1,000
Uninsulated electric copper wire—			
Total	15,000	22,000	+ 7,000
From Great Britain ...	1,200	3,300	+ 2,100
,, France	11,000	18,000	+ 7,000
,, Germany	1,000	200	− 800
Electric light fittings—			
Total	69,000	59,000	− 10,000
From Great Britain ...	6,700	6,600	− 100
,, Belgium	4,000	6,300	+ 2,300
,, France	17,000	12,000	− 5,000
,, Germany	24,000	18,000	− 6,000
,, Italy	6,000	3,000	− 3,000
,, Switzerland ...	4,000	4,600	+ 600
,, United States ...	4,000	4,000	—

£E=£1 0s. 6½d.

The Federation of British Industries.

Lord Gainford's Speech at the Annual Meeting.

THE annual meeting of the F.B.I. was held at the Mansion House on April 25th, when Sir Rowland Blades, M.P., was elected president in succession to Lord Gainford. The latter, upon relinquishing the position, delivered an address which surveyed a wide field in industry and allied subjects. In the course of this he said that it was very difficult to form a correct picture of the present position of British industry and trade. Something in the nature of an industrial revolution was taking place, and that was destroying the reliability of existing trade indicators and preventing the establishment of new ones for a time.

Before the war export trade was fostered by our investments abroad, and until recently there had been few indications of any revival of that system of development. Although he did not deny that there was room for improvement in the organisation of our exporting industries, he did not think that inefficiency and resistance to new methods had been the main cause of the post-war misfortunes of our export trades. Recovery from the effects of the war must necessarily be a slow and lengthy process. All kinds of handicaps had to be overcome; tariffs, currency instability, bounties, import and export prohibitions, and political and industrial disturbances had all opposed a return to equilibrium during the past ten years. A factor of almost equal importance in preventing re-adjustment in certain industries had been the march of invention and discovery which created new industries, to the detriment of the older ones. It was comforting to know, however, that our competitors, for all their efforts, were in no better position than ourselves, and it had to be remembered that our leading industries, depressed as they were, still did a very substantial proportion of the world's export trade.

The United States after the war was in possession of greater resources than ourselves, and, naturally, was better able to meet the changed conditions. Nevertheless, the prosperity which she had enjoyed for a long period had received a check, and lately her foreign trade had been almost as stagnant as our own, and her unemployment was greater. We could not rely upon the new industries to absorb our unemployed. They dealt largely with luxuries which could not be extended indefinitely unless there was an improvement in the means employed for providing our more elementary needs and essential services. There were several indications that our basic industries were recovering. There had been a steady expansion of orders, material prices had reached bottom, currency instability had almost disappeared, and our financial and economic position was being strengthened. In addition, trade-union leaders were in favour of better industrial relations, and in a truer sense than ever before it could be said that co-operation and combination were replacing competition and isolation. We still had to face keen competition, which meant that price and quality must be right. Rigid economy must be practised by the State, local authorities, and public services, as one means of reducing prices.

Lord Gainford proceeded to comment upon the growing realisation of the benefits of research, the education of personnel, and standardisation and simplification. He then said that, apart from purely domestic problems, the international situation had to be studied. Progress had been made in that direction, and the consultations which had taken place might have far-reaching results in the future. Although international industrial *ententes* were often possible and desirable for particular products and particular countries, they did not believe that any universal cartelisation of industry was within the bounds of practical politics. Governments should leave freedom of action to industrial organisations, while reserving the right to check abuses should they occur. Lord Gainford referred to efforts which had been made to lower or do away with trade barriers. There were some who considered that nothing practical would be the outcome of the Geneva Conference on the subject, but he himself felt that the Conference would have its influence upon the future.

Radio Signal Fading.

An account of the work of the Peterborough radio research station of the Government Department of Scientific and Industrial Research.

By Prof. E. V. APPLETON, F.R.S.

(*Summary of paper read before the* WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE first indication that atmospheric electricity played any part in wireless propagation was the discrepancy between the signal intensities observed in long-distance transmission and the calculated values deduced from the electromagnetic theory of the diffractive bending of waves round a sphere. Atmospheric ionization was considered a possible cause, and study of temporal variations of signal intensity and directional errors has resulted in direct proofs of the existence of the Kennelly-Heaviside layer, and evidence as to its height and diurnal variation.

Nocturnal variation of signal intensity (well known to broadcast listeners situated between 100 and 150 miles from an emitting station) is so marked as to be noticeable in the audible response of telephones or loud-speakers. The application of galvanometric methods has demonstrated the existence of small signal variations (undetectable in telephones) at much shorter distances from the emitting station than 100 miles. When working at the shorter distances there is a strong ground wave of fairly constant intensity, which may be used as a kind of reference ray in terms of which the intensity of the interferent rays causing fading may be specified. This advantage has been utilised in most of the experiments carried out at the Peterborough station.

In accordance with the ionized-layer theory we attribute these signal variations to the variable nature of waves deviated through large angles by the upper atmosphere, and, in keeping with the theory of the origin of directional errors suggested by Eckersley and Bellini, we assume that the downcoming waves possess components of electric force both in and at right angles to the plane of propagation.

Direct intensity measurements are insufficient to enable us to determine the various unknown quantities in the formulæ, but advantage may be taken of the effect of changing the transmitter wave-length *continuously* through a small range.

Studying only the signal variations on a vertical aerial and on three loops (arranged, say, in the plane of propagation and at 45 deg. to it on both sides) enables the use of only four equations for five unknowns, but if a wave-length change is made we may confine our attention to maximum and minimum values and again obtain solutions. We may summarise the advantages of the method as follows:—

(*a*) It enables us to solve the problems mentioned above, which are not soluble by simple intensity measurements.

(*b*) It does not require a knowledge of the strength of the ground ray.

(*c*) It is a very sensitive test of the presence of downcoming rays, especially when the latter are weak.

(*d*) It enables us to estimate the path differences between the ground wave and the atmospheric wave, and thus to find the equivalent height of the ionised layer.

(*e*) The records demonstrate at once the sumultaneous reception of two atmospheric waves if the rays have different optical paths.

As some compensation for these advantages, we have to assume that during the wave-length change the downcoming waves do not alter in polarisation, intensity, or phase, except in so far as the last-mentioned is artificially altered by the frequency alteration itself.

The general study has led to the following conclusions:—

(1) Fading is due to the effects of variable rays deviated by the upper atmosphere, proved by the combination of two results: first, the fact that interference maxima and minima are obtained when the wave-length is changed indicates the presence of two sets of waves, one of which must be the ground wave; secondly, the fact that the interference maxima are bigger when signals are received on a loop aerial than on a vertical aerial indicates that one set of waves reaches the ground with an angle of incidence less than $\frac{1}{2}\pi$; in other words, that one set of waves comes down from above, which is proof of the existence of the ionised layer.

(2) Measurements of the equivalent height* of the ionised layer made during the dark hours show that for most nights, after sunset, the height gradually increases, reaching its maximum value about an hour before sunrise, when a somewhat rapid change takes place, the height being reduced to the lower day-time value. After sunrise the intensity of the downcoming ray is so much reduced that determinations of the height by these methods become increasingly difficult. During a normal night the height may vary from 90 to 130 km, but, on occasions, in winter, heights of from 250 to 350 km. have been frequently measured during the three hours before dawn. On these occasions, after the large values for the height have been recorded for two or three hours, a discontinuity in the series of values occurs 30 to 40 minutes before sunrise, and heights of the normal value are again recorded. These observations seem to indicate that there are nights when, during the period before dawn, the ionisation in the Kennelly-Heaviside layer has been sufficiently reduced by recombination to permit of its penetration by waves of this frequency. Deviation takes place, however, at an upper layer which is richer in ionisation. With the advent of sunrise, at a height of 100 km., or so, solar radiation causes the formation of the Kennelly-Heaviside layer again, and deviation by the lower layer again takes place. The normal fall of the under-boundary of the lower layer then follows, as the more direct solar influence increases the region ionised. As the day proceeds, the observations suggest that another region of ionisation is formed below the Kennelly-Heaviside layer which, while causing attenuation of the waves, does not very materially affect the height at which they are deviated.

(3) On the whole, the observations show that intensity variations and, to a lesser degree, phase variations are the chief causes of signal fading.

(4) The downcoming wave may be described as approximately circularly polarised with a left-handed rotation. It seems possible that this is caused by the influence of the earth's magnetic field, but the matter cannot as yet be regarded as completely settled; a critical test would be to repeat the experiments in the Southern Hemisphere, in which case the resulting polarisation would be right-handed, if the effect is due to the earth's magnetism.

We can incorporate these results to simplify equations for a single downcoming ray, which may therefore be used to show the correlation which exists between directional errors and fading.

To illustrate the kind of records that are being made at Peterborough, the observations made on the occasion of the solar eclipse on June 29th, 1927, are typical. The measurements made on special transmissions from the stations of the British Broadcasting Corporation show that the eclipse produced a very definite effect on the properties of the ionised layer responsible for deflecting waves of 300-400 m. back to the ground. The most striking was the large increase in the intensity of the downcoming ray, which was detected at both near and distant receiving stations, and may be ascribed partly to the increase in height of the stratum responsible for bending back the waves, and partly to the rapid removal of ionisation in the lower layers of the atmosphere consequent on the removal of the solar ionising agents. The increase in the height of the stratum was large and the results as a whole seem to suggest that the more southerly receiving stations experienced the maximum eclipse influence a little earlier than the northern stations.

A striking feature of the observations was the short time the eclipse effect lasted, varying from 20 to 50 minutes at the different stations, while the total time taken for the moon's shadow to pass across the sun was nearly two hours. This means that quite an appreciable fraction of the sun's radiation may be cut off before the effect can be detected by wireless methods.

In conclusion, it may be mentioned that the morning after the eclipse was exceptional in that night-time conditions seemed to persist for such a long time after sunrise; the records of all stations show evidence of this.

* This may be determined by calculation either from the value of the path difference between ground and atmospheric waves, or from the angle of incidence of the downcoming waves.

A Large Steam Power Station.

Some particulars are given in *Power* of the equipment which is to be installed in the 440,000-kW steam-electric station which is being put down by the Duke Power Company at River Bend on the Tatawba River, twelve miles from Charlotte. Excavation for the foundation of the first unit of 110,000 kW is now under way. The generating equipment of this unit will include two steam-turbine generators, each with a capacity of 55,000 kW. The turbines are designed for four-stage heating of feed water. Steam will be generated in four boilers at a pressure of 400 lb. per sq. in. and a total temperature of 725 deg. F. The boilers will be fired by a unit system of pulverised fuel. Space has been provided for the storage of 100,000 tons of coal at the plant. The location of the plant at a bend in the river provides an excellent arrangement for handling the circulating water. The circulating-water inlet is on the upstream side of the bend, and it is discharged through an 1,800-ft. tunnel leading to the downstream side of the bend in the river. This arrangement makes recirculation of the cooling water impossible.

Regulations for Overhead Lines.

The new "Overhead Line Regulations" were issued by the Electricity Commissioners on Thursday, April 26th, 1928.

BELOW we summarise the leading features of the new "Overhead Line Regulations for securing the Safety of the Public," issued by the Electricity Commissioners under the Electricity Supply Acts, 1882 to 1926, last week, showing where necessary the changes that have been made from the code issued in 1924, and where clauses have been omitted or inserted.

I. General.

1. *Material of Line Conductors.*—[Unchanged.]
2. *Strength of Line Conductors.*—[To comply with B.E.S.A. specification as before; proviso omitted.]
3. *Minimum Size of Line Conductor.*—New clause: The minimum permissible size for copper and other line conductors (other than service lines) shall be such as to have an actual breaking load of not less than 1,237 pounds, the equivalent minimum cross-sectional area and weight per mile for copper being as follows:—

Conductor, No. 8 s.w.g.; cross-sectional area, 0.0201 sq. in.; weight per mile, 409 lb.

The minimum permissible size of service line shall be such as to have an actual breaking load of not less than 816 pounds, the equivalent minimum cross-sectional area and weight per mile for copper being as follows:—

Conductor, No. 10 s.w.g.; cross-sectional area, 0.0129 sq. in.; weight per mile, 262 lb.

[Previously copper and aluminium line conductors were specified to have a breaking load of not less than 600 pounds.]

4. *Line Conductors to be Inaccessible.*—[As before, but to comply with Regulations 14 and 17 below.]
5. *Line Conductors Crossing other Lines.*—[Unchanged.]
6. *Supports.*—[As before, but red fir impregnated with creosote not obligatory for wooden supports, subject to the Electricity Commissioners' approval.]
7. *Factor of Safety of Supports.*—[Substantially unchanged; reference to foundations omitted.]
8. *Service Lines.*—[As before; reference to carriage-ways omitted.]
9. —New Clause: *Erection of line conductors at different voltages on same supports.*—Where line conductors forming parts of systems at different voltages are erected on the same poles or supports, adequate provision shall be made to guard against danger to linesmen and from the lower voltage system being charged above its normal voltage by leakage from or contact with the higher voltage system; and the type of construction shall be subject to the prior approval of the Electricity Commissioners.
10. *Inspection and Maintenance of Lines.*—[Unchanged (old clause 9).]
11. *Materials Used.*—[Unchanged (old clause 10).]

II. Specific Regulations.

A. *For voltages not exceeding 650 volts d.c. and 325 volts a.c. (as before).*

12. *Factor of Safety of Line Conductors.*—[As before (old clause 11), but the radial thickness of ice covering to be three-sixteenths of an inch instead of one-quarter of an inch.]
13. *Minimum Height of Conductors.*—New clause (old clause 12): The height from the ground of any line conductor (other than a service line), earth wire, or auxiliary conductor at any point of the span at a temperature of 122 deg. F. shall not, except with the consent of the Electricity Commissioners, be less than 19 feet across a public road or 17 feet in other positions. A height of 15 feet may be adopted in situations inaccessible to vehicular traffic. Where a service line is carried across or along a carriage-way, the height of the line from the ground at any part of the carriage-way shall not, except with the consent of the Electricity Commissioners, be less than 19 feet and 17 feet respectively.
14. *Provision to Prevent Danger.*—[Old clause 13, substantially unchanged.]

B. *For voltages exceeding 650 volts d.c. and 325 volts a.c.*

15. *Factor of Safety of Line Conductors.*—[As before (old clause 14), but allowing for a radial thickness of three-eighths of an inch of ice instead of half an inch.]
16. *Minimum Height of Conductors.*—[Old clause 15, substantially unchanged.] The height from the ground of an earth wire or auxiliary conductor shall not be less than the minimum heights prescribed in Regulation 13.
17. *Provision to Prevent Danger.*—[Old clause 16, unchanged.]
18. —*Road Crossings, &c.*—[Old clause 17.]
19. *Danger Notices.*—[Old clause 18.]

The Regulations, which are not retrospective, come into force as from April 16th, 1928. The new code, El.C.53, takes the place of El.C.39, and may be obtained from H.M. Stationery Office, price 2d. net.

Explanatory Memorandum.

In a Memorandum (El.C.53A) which accompanies the Regulations, the Electricity Commissioners mention that, in addition to copper and aluminium, they have in certain cases approved of the use of steel-cored aluminium, steel, cadmium copper, and other alloys of high tensile strength.

In view of the relaxation in the assumed ice loading on line conductors, and in guarding requirements, the minimum size of copper conductor is in future to be not less than No. 8 s.w.g.

The relaxed ice-loading conditions will enable supports of less expensive construction to be employed. An inquiry is in progress with regard to the factor of safety of reinforced concrete supports. Greater attention to the foundations of wooden poles will be necessary (requiring the addition of "kicking blocks") in order that they may be as strong as the poles themselves.

Live conductors must be covered with insulating material where they are within 6 feet of a building.

Lines at different voltages carried on the same supports are now specifically permitted, subject to adequate provision for the protection of linesmen.

The new ice loading is consistent with the tension experienced without ice loading when the wind of gale force exerts a pressure of 20 lb. per sq. ft.

Provided that one of the conductors is earthed at the point of supply and is placed below the other conductors, no other guarding on lower voltage lines will be required. The reduced minimum height permitted will enable many such lines to pass under other lines, and the requirements of the Postmaster-General will be satisfied if a single earthed wire is run above the power wires for the length of the span. The Postmaster-General has also agreed to modify his present requirement of 4 feet clearance between low- and medium-pressure power wires and telegraph lines, accepting a minimum of 2 feet.

In general, the effect of the various relaxations in the case of lower voltage lines will enable supports of reduced diameter and length to be employed. Moreover, the Commissioners are prepared to sanction in special cases a voltage variation within the limits of plus 4 and minus 8 per cent. of the declared voltage on rural lines for a provisional period, pending the completion of a distribution system and its full measure of interconnection.

The Commissioners suggest that authorised undertakers should apply for consent to more comprehensive proposals instead of making repeated applications for individual lines. By agreement with the Postmaster-General, the reference of all overhead line applications to him for his observations will be abandoned, but where high-voltage lines run parallel with Post Office lines, the undertakers should confer with the District Post Office engineers. The statutory notices to the Postmaster-General must still be given.

The Memorandum of Particulars required in connection with proposals to erect overhead lines has been modified to simplify procedure; tracings may take the place of maps, duplicate maps will not be required, and when full details have been given with one application, similar lines may be sanctioned without re-submitting full details.

Congratulations from the O.L.A.

We learn from Mr. R. Borlase Matthews, M.I.E.E., president of the Overhead Lines Association, that his general view of the Regulations is that they are most welcome; they will reduce the cost of construction by 25 to 30 per cent. "Further, the principle has been conceded that each undertaking once for all can get out a set of standards of construction which, when approved, can be used anywhere in its area. The only matter requiring further sanction is the actual route and the minimum height. From the rural electrification point of view still further relaxations of the Regulations are needed; however, such relaxations should be permitted only to those engineers who have really had experience in the construction of overhead lines. After all, as much experience is required in this branch of work as for cable laying, in which art British engineers lead the world . . . . Engineers who are really experienced in overhead-line construction can always submit their special designs to the Electricity Commissioners, as past experience has proved that they are extremely courteous and quite prepared to do everything within their power to facilitate progress, bearing in mind the heavy onus placed upon them of 'safety first.' In this country, more scare is raised if one person accidentally gets killed by electricity than if a hundred were killed by gas, or several hundreds by motor cars; hence the Electricity Commissioners have some justification for their procedure." "It would undoubtedly be of very great benefit to rural electrification," says Mr. Matthews, "if the duties of the Electricity Commissioners could be so re-allotted that one of them could devote his whole time to dealing with policies affecting the supply of electricity to the countryside."

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Road Traffic Sign.

At the road transport illumination demonstration which was organised by the Royal Automobile Club and held at Richmond Park on March 29th, an interesting feature of the exhibits was the A.T.M.-Robinson road traffic flashing lamp shown by Messrs. AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Strowger Works, Liverpool. It comprises a continuously flashing luminous warning signal, alternately red and white, and is visible, it is claimed, over a distance of a quarter of a mile.

Fig. 1.—Traffic Flashing Lamp.

The lantern is electrically rotated around the light source, a gasfilled lamp. Both the motor and lamp are fed from the same source of supply, and the complete appliance is adaptable to the usual standard supply voltages and frequencies. The motor requires practically no attention, even periodical lubrication being dispensed with, and it is calculated to stand up to strenuous usage under all weather conditions for an indefinite period. The signal is designed for mounting at a convenient height above the position normally occupied by a constable on point duty, and reflectors are so arranged that in addition to the warning red and white flash to all points of the compass, the traffic control officer is himself thrown into strong relief by the downward projected rays. A view of the sign is given in fig. 1.

A New Friction Pulley.

The accompanying illustration, fig. 2, shows the details of a new starting pulley which has been developed and put on the market by a German company for use in conjunction with squirrel-cage motors. The coupling mechanism consists of components which are rigidly connected to the motor shaft and others which rotate freely about the shaft. The fixed parts comprise a hub and conical shaped disks, while the loose portions are made up of a ring to which three centrifugal weights are attached. The weights are connected together by springs and, as the pull of these is overcome, are accelerated outwards in a radial direction, thus making contact with the surfaces of the brake disks. A feature of the pulley is that the centrifugal weights which bring about the power transmission are not rigidly connected with the driving or driven parts of the coupling. The disks move in an axial direction and are fitted on their outer surfaces with brake pieces of Ferodo-asbestos. The pulley proper, which rotates relatively to the hub during the starting period, is amply lubricated at its bearing positions. When the motor is started up, only the hub and, consequently, the pair of brake disks are immediately set into rotation; the pulley proper remains stationary and the free rotating ring and the centrifugal weights tend to remain stationary, but, nevertheless, are gradually accelerated due to the friction at the bearings.

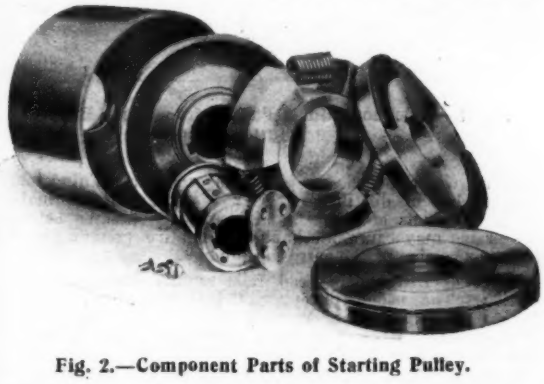


Fig. 2.—Component Parts of Starting Pulley.

A New Fuel-Pulverising System.

The BRITISH REMA MANUFACTURING CO., LTD., of Hubert Works, Highroad Well, Halifax, has recently placed on the market a pulverising mill, fig. 3, and vacuum system of air separation for which several important advantages are claimed. The grinding mill consists of a free-running ring of manganese or other very hard steel, inside which three specially hard roller crushers revolve. The top crushing roller forms the driver and, in working, the three crushers are pressed towards the inside of the grinding ring; the material is passed between the crushers and the ring. The bearings for the two free crushers are supported by springs only, and the arrangement enables the grinding to be efficiently maintained at all loads until the shells are so worn as to require replacing.

The vacuum system comprises an air separator arranged integrally with the mill to form one unit. A high-efficiency fan provides the air circulation necessary for lifting the raw material from the feeding device into the mill, the ground material from the mill outlet into the sifter, and the finely ground material from the sifter to the storage bin, or to the burners.

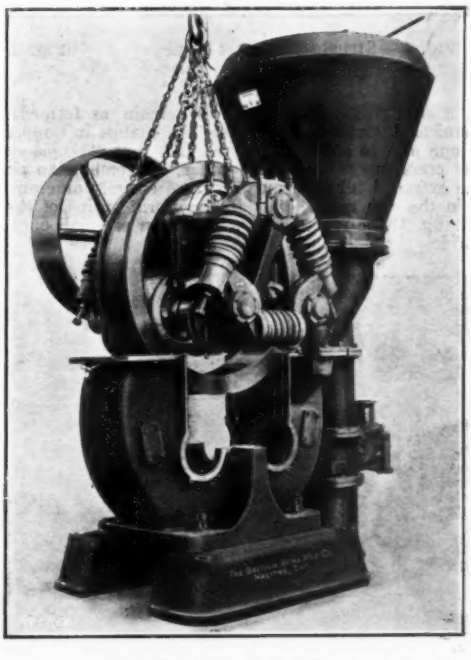


Fig. 3.—Pulverising Mill, showing Grinding Unit.

Coal containing up to 20 per cent. of moisture can be dealt with by the pulverising system, providing a source of hot air can be coupled up to the mill inlet pipe. This heat can be obtained by circulating the air round cavities in the furnace walls, or by providing suitable air heaters to extract heat from the waste flue gases. Eight "Rema" mills, each having a capacity of three tons per hour, have for some time been working at the electricity works at Mark, Hagen, where they are firing Babcock water-tube boilers on the direct-firing principle. The company has acquired the sole manufacturing rights for the system for the British Empire.

Lead Cable Sheaths.

Physical properties and weaknesses are connected with the inherent grain structure of the metal and the stream-line structure due to the extension process of its application; a new type of cable press has been evolved which applies a sheath that is weldless.

By P. DUNSHEATH, O.B.E., M.A., B.Sc., M.I.E.E., and H. A. TUNSTALL, B.Sc.

(*Summary of Paper published in the* JOURNAL *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

CONTRARY to a view still widely held among electrical engineers who have not studied metallography, the normal structure in metals is crystalline, and, in this respect, lead is no exception. The size and arrangement of the constituent grains vary considerably, and in themselves form a useful criterion of the physical properties of the metal; correctly interpreted, also, they are an indication of the previous history of the cable sheath, either during manufacture or in subsequent use.

Effect of Extruding.—The process of extruding a cable sheath has a considerable effect on the grain structure: whereas the melting point of the metal is 327 deg. C., extrusion is carried out at 200 deg. C., or less, as at this temperature the metal is in a soft plastic state and will remain as formed. The mechanical distortion of the mass, the change in temperature from one part to another, and the fact that different charges in the press merge into one another, all combine to produce in the extruded tube a grain structure entirely different from that in the cast metal; the large uniform grains of the cast metal (fig. 1) are replaced by a collection of small ones varying widely in size.

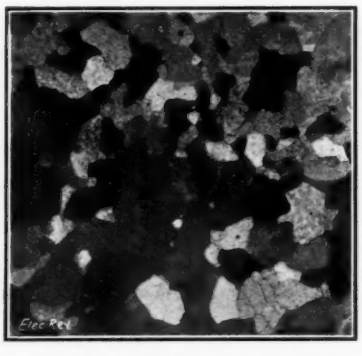


Fig. 1.—Structure in Cast Lead (Mag. = 5*).

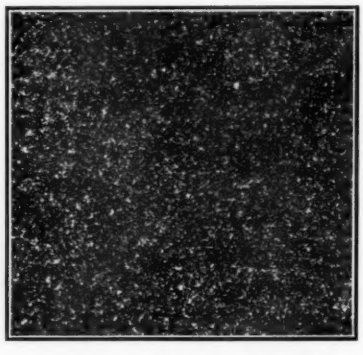


Fig. 2.—Cast Lead Quenched (Mag. = 17*).

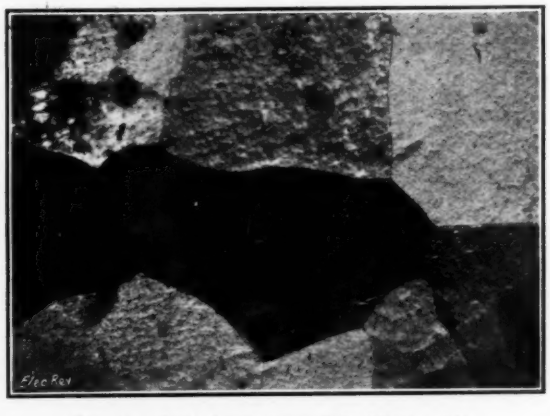


Fig. 3.—Cast Lead Annealed (Mag. = 17*).

When a large crystalline grain passes through the passages and die of a sheathing press, it is subjected to heavy shearing stresses, which result in a sub-division of the grains. It does not follow that the joints between the resulting smaller grains form a weakness in the structure; it is generally accepted that they are sources of strength, and the intercrystalline cement is thus actually generated in the process of extrusion.

Effect of Annealing.—Changes can be brought about by heat treatment: if solidification takes place quickly, the mass of metal, instead of consisting of large crystals, takes on the form of an amorphous aggregate, which really consists of a mass of very minute crystals. Rapid cooling produces small grains, and slow cooling large ones (figs. 2 and 3); the higher the temperature the quicker the operation. Lead is usually considered to be self-annealing, *i.e.*, if left long enough after deformation it will slowly become re-annealed at normal atmospheric temperatures. Because of this characteristic, quenching, to be effective in producing a small structure, must be carried quickly over the wide range necessary to produce the change in viscosity which is necessary to restrict the crystal growth.

In annealing a soft metal the grain size produced appears to be dependent on the extent of previous deformation: the less the work done on the metal the greater the grain size; also, the temperature required to produce appreciable annealing is lower if deformation has been great than if it has been slight. When a metal is hot-worked the grains are momentarily distorted, but, owing to the high temperature, spontaneous recrystallisation takes place throughout the process. The grain size in a completed cable sheath is thus dependent on the two opposing factors, the reduction due to working and the magnification due to annealing. The variation in grain size over the section is thus accounted for by one of the two effects preponderating, and the average size will form an indication of the finishing temperature. A high extrusion temperature will be accompanied by large grains, and a low temperature by small grains, although in a lead press the variation of temperature possible will not result in exceptionally large, or exceptionally small, crystals.

Effect of Stress.—Quick application results in plastic fracture, the tensile stress being about 2,400 lb. per sq. in. and the elongation about 45 per cent. The crystals are not pulled apart, but deformed and broken up. The fracture under the prolonged load has a similar plastic appearance. A sample identical with that which broke at 163 lb. on a quick test was loaded with 70 lb. continuously in a quiet place at normal temperature, and failed after 230 hours' continuous loading. When test-pieces (identical in form and material with the previous ones) were subjected to high-frequency bending, the grains were generally pulled apart, the cracks following the grain boundaries.

Influence of Chemical Corrosion.—Although quite distinct from the actions underlying the usual disintegration of lead cable-sheaths, discussed later in the paper, "season cracking" is closely allied. Articles of brass and other metals crack spontaneously after prolonged use, and in lead of a purity of 99.94 per cent. intercrystalline brittleness developed when the corroding media were present. The action increased with the magnitude of the stress, but only the intercrystalline material was attacked, the individual grains remaining intact without loss of ductility. It is possible that the formation of the products of chemical action in the fissures between the grains may cause mechanical disruptive pressures owing to the expansion of the corrosion products.

Fig. 4.—Telephone Cable Failure from Steep Exposed Position.

Effect of Distortion.—Lead fails rapidly on repeated distortion. The usual conception that long-continued stresses induce crystallisation of a cable sheath is wrong; all lead is crystalline, vibration does not crystallise, nor is crystallisation the cause of disintegration.

Cases in which one factor only is involved are rare, and usually we have to assess the responsibility for the effect between the various probable causes.

* Slightly reduced in reproduction.

Sheath Disintegration.—Aerial lead-covered cables may be subjected to any or all of the various primary causes of disintegration detailed in the previous section. Repeated distortion, for instance, may be introduced quite unwittingly by passing direct into a building a cable from an open span which swings in the wind; at the point of entering the wall the localised stressing may cause ultimate failure, unless special precautions are taken.

The effect of tensile stress with vibration superimposed was shown in a sample of small telephone cable taken from a line climbing a steep hill-side in a very exposed position (fig. 4); the weight of the cable, no doubt, kept the lead in tension and made it more susceptible to the vibration due to the wind.

A small lead-covered telephone cable failed in service near

Fig. 5.—Railway Signal Cable Failure; Intercrystalline Fracture (Mag. = 16).

to gun-firing butts; the concussion resulted in severe intercrystalline fracture.

Disintegration of cable sheaths on board ship may usually be traced to a combination of several factors, such as the "working" of the hull in rough seas, expansion and contraction, and vibration on turbine boats.

Cases of failure of cable sheaths have occurred on telephone and signalling cables laid alongside railway tracks and subjected to the vibration of passing trains (fig. 5), particularly on bridges.

Mitigation of Vibration Troubles.—Care should be taken to avoid weakening the lead sheath by excessive handling during installation. The cable should also be laid in such a manner that the lead cannot be subjected to tension in use; it is advisable on a long run to provide loops at intervals so that

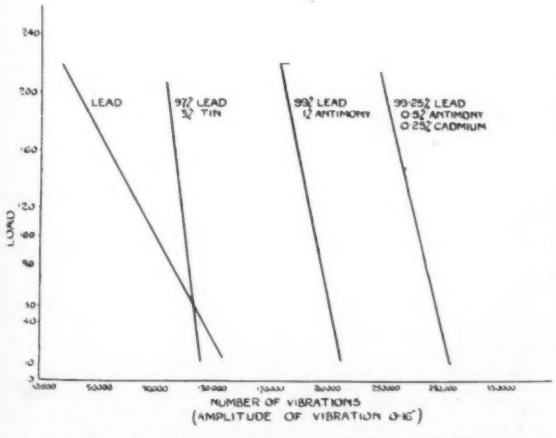


Fig. 6.—Relation between Load and Number of Vibrations to produce Fracture.

slack is available for taking up during cold weather, and a good deal can be done to prevent vibration reaching the cable by inserting pads or springs between it and the supports. The support given by wire armouring is, of course, always of great assistance in preventing disintegration, as the steel wires not only relieve the lead of any tension, but also prevent repeated distortion. When armouring is not practicable a thicker lead sheath can be employed with advantage, and the use of special alloys is an important safeguard.

Two ternary alloys which are attracting attention at present for cable sheathing (the authors are permitted to publish this information by the courtesy of the British Non-Ferrous Metals Research Association) are: (1) 98.25 per cent. lead, 0.25 per cent. cadmium, 1.5 per cent. tin; (2) 99.25 per cent. lead, 0.25 per cent. cadmium, 0.5 per cent. antimony. The order in which the metals may be placed as far as resistance to vibration is concerned is: Lead, tin-lead binary alloy, antimonial-lead binary alloy, and antimonial-cadmium-lead ternary alloy, the last-mentioned being the most resistant.

The relation between the number of vibrations to which various lead alloys were subjected before fracture occurred on a fatigue testing machine with tension applied to the test piece is shown in fig. 6. The amplitude of vibration was kept constant during these tests at 0.16 in. The amplitude has a very important influence on failure by vibration.

Extrusion Process.—From what has been said about the dependence of physical properties on grain structure, it is evident that the nature of the stream-line flow in the formation of the tube at the press is an important criterion in the quality of the finished sheath. When a ram forces a mass of plastic material in the form of a cylindrical rod from a

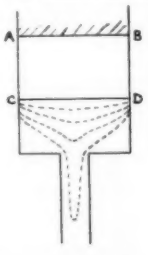


Fig. 7.—Flow of Plastic Metal through Cylinder.

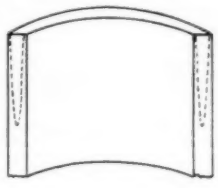


Fig. 8.—Flow of Plastic Metal in the Form of a Tube.

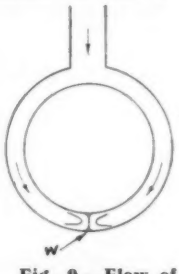


Fig. 9.—Flow of Plastic Metal Round Cable.

simple cylinder (fig. 7) down to CD, is withdrawn and then applies pressure to a new charge ABCD, the surface of contact between the old and the new charge does not advance as a plane surface, but, owing to friction between the material and the sides of the cylinder, the centre advances at a greater rate than the outside and the contact surface assumes a depression of increasing depth, as shown by the successive dotted lines. In the rod issuing from the die there may consequently be a long tongue-shaped junction surface between the charges. If a tube is being extruded, the tongue produced by one charge working its way into the previous one may exist in both sides of the wall of the tube (fig. 8), and a further irregularity is due to the lead passing round the cable from opposite sides, resulting in a joint or weld at W (fig. 9).

Fig. 10 is a magnified view of a weld from one type of press; the stream lines formed from residual metal are shown up as an alteration in crystal size owing to increased deformation at this point, as indicated in the previous section. Provided suitable working of the press is adopted, the junction is metallic and no weakness will exist.

Complicated combinations of the simple form of weld shown will be met in practice owing to slight variations in roughness and temperature at different parts of the flow, causing variation in velocity of different parts of the mass, as well as the fact that, unless due precautions are taken, the metal at the

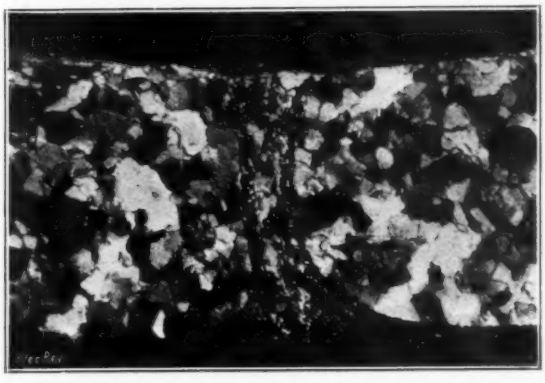


Fig. 10.—View of Sheath Weld (Mag. 15).

weld may contain lead oxide, oil, carbon derived from charred oil, and other dirt between the crystals. One of the most serious defects that can exist in a cable sheath is a longitudinal split in the tube which may be quite invisible when the cable leaves the press; it may actually hold up during factory tests and only be revealed by mechanical distortion. Split lead is entirely associated with the formation of foreign material at the weld between the two or more streams of metal which flow round the cable in the die chamber. Surface blister in a lead sheath is due to the same cause.

New Cable Press.—The new "straight-through" type of press recently invented by Mr. Judge (fig. 12) is a drastic departure from previous designs (fig. 11). The outstanding feature is the passing of the cable to be covered through the centre of the hydraulic lead rams, so permitting the looping of the mass of lead round the cable in a perfectly fluid form, and

the entire elimination of any weld between solid, or even plastic, metal faces in the formation of the tube. The die for the outside of the lead tube is carried at the front of the press, following usual practice, but in order to avoid breaking up the annular stream of lead the point forming the inside diameter of the lead tube is carried centrally from the back end through the entire length of the lead cylinder. The lead ram is necessarily of peculiar design: the head presents an unbroken ring for pressing the charge of lead forward, the pressure being transmitted to it from the hydraulic piston behind by means of four segmental shaped legs which pass through shaped holes at the rear of the point holder and lead container.

In operation the lead ram is drawn back for cleaning, the ram then advanced sufficiently far to close the special cleaning ports and the cylinder filled with molten lead from the lead pot mounted on the top of the press. By inclining the main axis of the press upwards towards the back, air is excluded from the container when recharging.

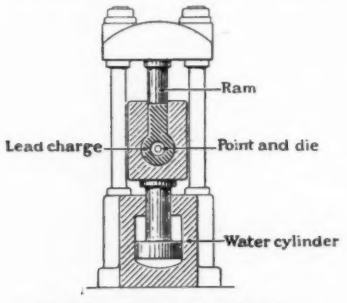


Fig. 11.—Vertical Cable Press.

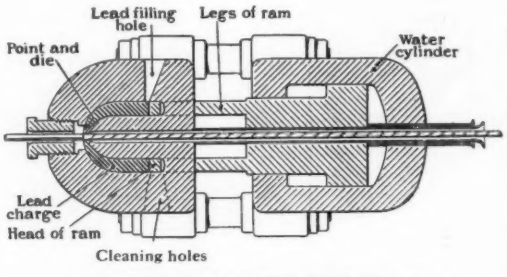


Fig. 12.—Straight-through Cable Press.

During the past 12 months the authors have carried out a complete investigation on cable sheaths made on one of these new presses, and a photograph showing the improvements obtained is reproduced in fig. 13. The crystal structure shows no stream lines whatever, the whole cross-section consisting of sound metal of normal crystalline construction. The introduction of a new charge produces certain other features: for instance, several masses of small crystals are contained in the section of the sheathing arranged more or less circumferentially, but it introduces no weakness. It is shown that, further along the length, the new charge occupies more of the cross-sectional area, and that there is slightly uneven advancement, the structure being an incomplete ring of the new charge, the circumference of which is surrounded by the old charge. Still further along the length of sheathing the new charge is in the form of a complete ring surrounded by the remains of the old charge, and finally a featureless section is again produced.

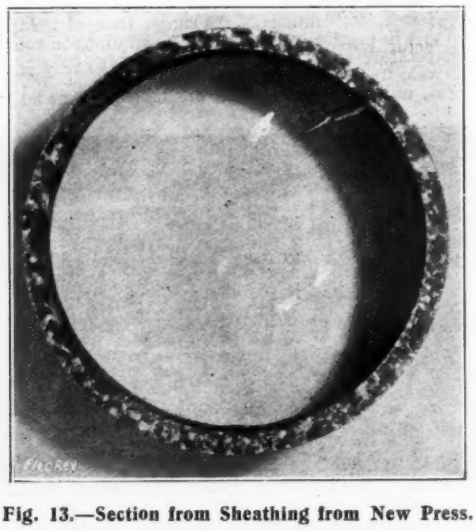


Fig. 13.—Section from Sheathing from New Press.

In the sheathing examined from the straight-through press, stream-line features are entirely absent for more than three-quarters of the length of a complete charge of lead from the container, and where they do appear they take the form of a perfect annular scarf.

Bursting tests carried out on tubing extruded by this press give bursts of a form showing a clean longitudinal tear typical of sound lead; there can be no split-lead fracture.

The investigation described above was carried out during the past seven years in the research laboratory of W. T. Henley's Telegraph Works Co., Ltd., and resulted in the invention of the new press described.

Marine Lights and Fog Signals.

Trinity House uses of electricity in lighthouses and for fog signalling devices.

(*Extracts from a paper read before the* ROYAL SOCIETY OF ARTS.)

CAPT. SIR ARTHUR CLARKE, K.B.E., recently surveyed the history and work of the Brotherhood of the Most Glorious and Undivided Trinity of Deptford-Stronde, better known as the Corporation of Trinity House, London, of which he is an Elder Brother. The following notes are based upon his paper.

Electric Lighthouses.

Concerning lighthouses and lightships, buoys and beacons, a first-class light is of not less than 500,000 c.p. Where higher powers are required, electricity is chosen for the illuminating source: hitherto the arc lamp has been employed, but the development of incandescent-filament lamps has caused its supersession,* and lamps of up to three and four kilowatts are now installed in lighthouses; they have been combined with automatic electrical equipment which permits of economies being realised. At South Foreland, despite the fact that the power of the light is over a million candles, the whole installation is automatic, the clock revolving the lens being wound up electrically at regular intervals, and a lamp changer being installed for automatically replacing a lamp when the filament of the one in service burns out, or for bringing a stand-by acetylene burner into focus if the electric current fails. The keeper maintains no watch and need not remain in the lantern, he being kept advised of the running of the light by means of tell-tale devices. A somewhat similar installation has been put into the Lizard lighthouse, and at Pendeen, Skerries and Hartland Point, where high-candle-power is deemed necessary, and in order to obviate a double watch being kept during fog, electric light has been introduced in place of the petroleum-vapour mantle-burner system, while similar installations have been put on four new light vessels; in these cases, the electric power is generated *in situ* by small modern semi-Diesel engines direct-coupled to the dynamos. For secondary lights and buoy lighting, acetylene gas is generally adopted except where a local supply of electricity is readily obtainable, an instance of the latter being at Burnham, where the two leading lights are being converted to take incandescent filament lamps.

Radio Fog Signals.

Fog signals are provided: (1) by aerial signals; (2) by submarine signals; and (3) by wireless signals. In the submarine group oscillators are actuated electrically: they comprise a vibrating diaphragm of large dimensions, similar to a telephone, sending out a high note to which can be given a characteristic code, and the underwater range of the signal has been known to exceed 50 miles.

Wireless fog signals are of three types: (1) A stationary beacon transmitter from which a characteristic signal is sent out in all directions; (2) a rotating short-wave directional beam transmitter; (3) a rotating loop transmitter.† Each system has its merits, but (1) is probably the most efficient of the three. It is comparatively cheap to install, easy to maintain, and can be fitted either on shore or on board a light vessel. Moreover, this form of signal necessitates a ship being fitted with a direction finder, and when the wireless signal is combined with an underwater signal and made to synchronise with it, distance from as well as bearing of the station can be obtained.

A typical beacon station on Round Island, one of the Scilly Islands, has been in operation for nearly nine months.‡ The whole of the equipment is automatic, and it has been found practicable to run the station without addition to the present staff, who receive emoluments for the small extra duties imposed upon them. Four more similar stations are in course of erection at Caskets, Skerries, Start Point, and on Lundy Island.

A signal of the second type has been installed at Inchkeith in the Firth of Forth, and though the receiving apparatus is simple, inexpensive and inelaborate, the range is small and a large rotating structure is required for producing the beam; in addition, as the bearings must be given relative to a fixed zero, the system is inapplicable for use on a light vessel.

The third system may have its advantages in that the receiving apparatus is small and inexpensive, but the power employed is nearly twenty times that of the beacon for less

* ELEC. REV., January 6th, 1928.
† ELEC. REV., January 20th, 1928.
‡ ELEC. REV., October 7th, 1927.

range, while for the cost of one of these stations four beacon stations could be established; the cost of maintenance, too, is high and will probably prove to be about ten times that of the beacon station, as a careful watch must be kept on the timing of the rotation of the loop, which means special keepers being always in attendance to look after both this and the large power plant. Experiments have shown that the transmitter is delicate and must be free from local interference if accuracy of bearing is to be assured, so that sites for this type of station have to be carefully selected. Like the second system, this one also is incapable of adaptation for use on a floating body, because of the necessity of having fixed zero points. One loop station has already been established experimentally at Gosport.

Discussion.

Comm. F. C. SHANKLAND (Port of London Authority) pointed out that when it was remembered that the cost of lighting the coasts, *viz.*, £1,000,000 per annum, was less than the cost of a single large mail and passenger boat, which might be £1,500,000, or more, the cost of the lighting service would not appear to be excessive.

Mr. C. C. PATERSON (General Electric Co.) referred to the very great advances that had been made in the automatic electrical control of various devices and shore lights; it was gratifying to realise how reliable they were. Though the present types of electric lighthouse lamp were large, it should be possible to make them of even greater power if necessary.

High-Pressure Cable Testing.

A Lecture given by Mr. M. M. Hochstädter before the Electrical Power Engineers' Association.

AT a meeting of the London Local Technical Group of the Electrical Power Engineers' Association, on April 25th, at which Mr. W. J. Jeffery presided, Mr. M. HARTIN HÖCHSTÄDTER gave a lecture on "Testing High-Tension Cables for Reliability in Service." He had chosen this subject because the testing of h.p. cables in regard to their reliability in service was a subject of great practical interest, as had been shown by the discussion in the ELECTRICAL REVIEW some time ago.* The users in the United States of America appeared to have gone much farther than those in other countries in the matter of research, having formulated intricate tests and indicated to the cable makers how cables should be made. It did not seem, however, that this had resulted in more reliable cables being made there as compared with Europe. It was now recognised that no one test was sufficient. Both the ionisation and the stability test needed the addition of other tests; one reason for this was the time involved in carrying out the latter test on all the drums of a consignment of cable. The time-voltage test was introduced as a specific characteristic for h.p. cables, and it had also been proposed by others as a means to estimate the probable life of a cable. The time-voltage characteristic was valuable for the purpose of giving interesting information for a certain make-up of a cable, but it did not seem to be applicable for comparative routine testing. Recent studies had been made by Mr. Barrat and himself with a view to finding out if the whole time-voltage characteristic of a cable, supposed to be homogeneous, could be explained without the existence of faulty paths in the dielectric, but only on the basis of the known inherent losses of the dielectric under pressure and the known law of dissipation of heat. A large number of tests had been made and a mathematical theory had been worked out for the phenomenon from this point of view. These results would shortly be published in full, but the following general conclusions had been drawn from the work, *viz.*, (1) the shorter the time of exposure, the higher is the breakdown voltage of a cable; (2) the usual technical time-voltage characteristic for cables may probably be entirely explained on thermal reasons. At the same time it appeared that as the dissipation line depended on a great number of circumstances outside the cable, the time-voltage characteristic, if the author's theory were true, could not be totally a characteristic curve of a certain cable so as to be used as a means to judge the qualities of the cable. It was highly desirable that the value of the power factor should be low and the power-factor-temperature curve be flat. This followed from the fact that if the dangerous temperature limit was reached by high loading or electric stress, or both, a high power factor was particularly noxious, or if the cable got into the zone of thermal instability when more heat was generated in it than could be dissipated, then a steep rise of the power-factor-temperature curve was particularly noxious.

The ionisation characteristic, often called the power factor-voltage curve, was not, in itself, sufficient proof of the quality of a cable and of its likely behaviour subsequently in service. Dr. Bowden and himself had suggested a rule for this test for a 33,000-volt cable, but similar rules might easily be derived therefrom for cables at other pressures. This proposal gave limits for the absolute value and the slope of the characteristic based on actual experience. He believed the proposal was fair because it might be considered as giving a sufficient guarantee for high-class manufacture and at the same time leaving sufficient margin for variation in manufacturing practice. The ionisation characteristic was, however, not sufficient proof of the quality of a cable. It ought to be supplemented by other tests and particularly by the stability test proposed in the article in the ELECTRICAL REVIEW by himself and Dr. Bowden in November last year.† A cable was understood to be stable if it maintained the qualities which had been imparted to it by the manufacturer and, on the other hand, he regarded a cable as unstable if it had undergone irreversible alterations, generally for the worse, through some internal or external cause. It was known by experience that it was possible to produce practically stable cables to give satisfaction up to service temperatures which were rather high, and this applied generally to those cable makers with modern installations and scientificaliy controlled manufacture. Incidentally, this was undeniable proof that it was not necessary to resort to complications such as the liquid oil-filled cable for obtaining a stable cable.

Mr. Höchstädter said the one general conclusion which might be drawn from his researches was that the operating temperature of e.h.p. cables should be limited to a safe figure, say, 60 deg. C. Personally, he preferred 50 deg. C., which, he believed, would prove beneficial both as regarded safety of operation and economy. It had to be borne in mind that there would always be places where cables would heat up to, say, 10 deg. above the permissible limit.

Among the features to which attention was drawn in some slides shown by the lecturer, was that beyond the ionisation point instability took place, so that every measurement beyond the ionisation point depended upon the history of the cable before that measurement. It was also pointed out that instability might exist in new cables with a pronounced ionisation, and experience had shown that such a cable was not fit for service, at any rate as far as a voltage in the neighbourhood of its ionisation point was concerned, because such a cable would show further deterioration in course of time. Cases were also mentioned of good cables being spoiled by external influences, *e.g.*, by an excess of temperature rise above the limit temperature. Mr. Höchstädter said that his experience had shown that the limit temperature for H-type cable as manufactured by a considerable number of firms would lie between 60 and 80 deg. C.

Discussion.

Mr. G. L. ADDENBROOKE said the question of cable testing, until recently, had been looked upon as a highly technical subject about which neither engineers nor physicists need concern themselves except in a very elementary manner, but the study of dielectrics was a very broad subject indeed, and it was very important to get a general idea of the nature of the actions which occurred. Until comparatively recently it was thought that the losses which occurred in electric fields were something that happened to the molecules of the mass of the material itself, something similar in nature to hysteresis in iron. That idea, however, had gradually receded, and it was now agreed that the losses were due to the presence of minute quantities of moisture chiefly in dielectrics.

Capt. P. DUNSHEATH said that although the explanation of the thermal treatment of time-voltage which the author had put forward was of considerable value and interest, he did not think that it met all the known data on the subject; there was something more than thermal considerations to account for time-voltage, because it was known that the time-voltage relationship extended over considerable periods of time, up to 12 months. The thermal theory would also lead them to believe that a cable of low dielectric loss was necessarily one with a good voltage relationship, but he had definite evidence which indicated that there was no relationship between the two. As a matter of fact, he would have been delighted to find it because he was looking for the same thing that the author had predicted, but it did not seem to exist. If the theory was right, therefore, there were some other considerations which were masking the effect, of which we did not know at present. He agreed that the user should restrict himself to specifying what he wanted in the way of behaviour, and not attempt to specify what should go in the cable. It only hampered the makers if users told them how to make cables.

Mr. RILEY said the pressure test was required to determine if there were any local weak points in the dielectric; none of the other tests would determine that. The ionisation test was an indication of whether the cable was full of compound or whether there were any vacuous spaces existing. The stability test was the one which gave the best approximation to service conditions; a question was how this test could be carried out. Some makers felt that the cable should be raised to the same temperature throughout the whole of the dielectric,

* ELEC. REV., Vol. CI, Dec., 1927, pp. 946, 1017, 1107; and Vol. CII, Feb. 10th, 1928, p. 262.

† ELEC. REV., Vol. CI, Nov. 25th, 1927, p. 894.

but that was a very controversial point. He felt it was possible to reproduce service conditions by current heating in the drum, provided the temperature external to the drum, say a bath of water or oil, was raised to about the accepted lead sheath temperature in service. If a cable was laid in the ground, the particular ground in the factory might not be anything like the ground in which it would be used in service. He suggested that current heating was the ideal arrangement, provided the external temperature of the cable was raised to a figure comparable with what it would be in service.

Mr. RICHARDSON said he and other users were interested to see from the paper and discussion that cable manufacture was at last becoming an exact science, or at least that the makers were taking some steps in that direction. He agreed wholly with the suggestion that users should leave the design of cables entirely to the makers. A great deal had been heard of the suggestions of users across the Atlantic with regard to the manner in which cables should be manufactured, but experience rather suggested that cables made over there had nothing like the reliability of those made in this country.

Mr. WOOD expressed the view that it would be to the advantage of the electricity industry if the cable users would refrain from tying up the makers in the manufacture of these paper cables which, when all was said and done, to use a stock phrase, were yet in their infancy. Many who had years of experience in using cables knew their wonderful reliability, and it was only a matter of time when the difficulties which had been experienced with super-tension cables would be overcome.

Mr. HÖCHSTÄDTER, in reply, said it was extremely difficult to get rid of the last traces of water in paper as well as impregnated cables, but at the same time it must be borne in mind that the remaining traces of air and gas were just as important, and it was difficult to say if a certain behaviour of a cable was due to the remaining traces of water or air. Capt. Dunsheath was quite right in suggesting that cables could break down under the thermal theory after two years or even longer periods, but of course, there were other reasons which came into play.

The method which Mr. Riley proposed of heating a drum in a big tank was a very good one, but would probably be expensive owing to the volume of oil necessary. As a matter of fact, it had already been discussed. On the other hand, there was the method of heating the drum in a chamber, which he believed was the more usual way. Again, he would have been glad if users had come forward with some suggestions as to how to carry out this test, because it was in their own interests. There was a difference when the cable was heated by current and laid out in a factory or heated in a chamber. In the latter case the centre of the cable would not be heated up to a maximum temperature as was the case when the heating was by the current. The latter method corresponded more to the use of cables in service, but the first method was easier to carry out. The point as to whether users should give advice to the cable makers or not had been referred to, and personally he did not think it was easy for users to do this. It was already very difficult for the makers, and he had seen cases in the United States where cable makers, forced by users to carry out what were thought to be improvements in one direction, had actually found the results to be detrimental in other respects. Therefore, it was much better for the user to state what he wanted and leave the manufacturer to make the cables, according to his experience.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Battery Eliminators.

Mr. Leonard Bounds's suggested regulation, in his letter on the above subject, to the effect that all broadcast receivers worked from d.c. mains should be fitted with an output transformer, would, it is true, granted a reliable transformer, remove danger of shock from headphones or loud-speakers and fire risks due to defective wiring. Your correspondent appears, however, to have overlooked the danger to which I drew attention in a previous issue, arising from the receiver itself, which cannot be isolated in the manner he suggests.

In the vast majority of broadcast receivers there are metallic parts connected to the "earth" or negative side of the h.t. supply, which are accessible to the user. It is only necessary to mention l.t. battery terminals, aerial and earth terminals, screens, dials, switches, front panels even. If a d.c. "eliminator" is used on the negative outer of a 3-wire system, the full mains voltage is impressed on the above-mentioned portions of the receiver, to the distinct disadvantage of members of the family who may attempt to tune in.

If the receiver is assumed not only to be fitted with a well-insulated output transformer, but to conform to the best electrical installation practice regarding all its metallic parts, what about the l.t. battery? It is not everybody who has this component safely enclosed within an insulated compartment of his receiver. It is more usually to be found in a situation which suggests that its owner is unaware that celluloid is not the best fireproof insulator for the "hot" side of his mains.

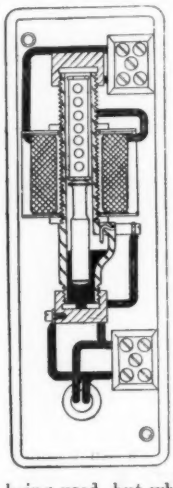
I submit that there are not many receiving installations, even if fitted with an output transformer, of which a fire insurance company would cordially approve when connected to d.c. mains of the type indicated. The only apparatus of the kind which can be regarded as entirely satisfactory from the point of view under discussion is that in which the receiver and power supply are designed and constructed as a whole, with due regard for the principles applicable to domestic appliances generally which are to be connected to public mains.

M. G. Scroggie, B.Sc., A.M.I.E.E.,
Chief Engineer, Burndept Wireless, Limited.

London, *April 23rd*, 1928.

Domestic Water Heating.

The question of switching-out long-hour loading circuits, such as water heaters, &c., is now receiving the attention of numbers of supply engineers in their efforts to improve their load factor. The relays manufactured by Electrical Utilities, Limited, of Park Royal, N.W.10, are now being extensively used for such services. In most instances the series pattern relay is being used, this breaking a secondary circuit of any value up to 5 amperes at 230 volts, a.c. or d.c. The operating coil can be wound for any current value required, and is equally satisfactory in action, whether used on a.c. or d.c. circuits, and it can be calibrated to operate on any current value to one-half its normal rating, the adjustment being a very simple one, *viz.*, slackening one nut and tightening another, thus raising or lowering the coil on the ebonite tube (see diagram).



It will be seen that these instruments are most simple in construction, and they have the advantage of absolute certitude of operation, further to which the maintenance costs become practically a negligible factor—therefore making them the ideal instrument for the purpose. In some cases the shunt circuit relay is being used, but whichever type of instrument is installed, the users thereof are unanimous in expressing their complete satisfaction.

London, *April 23rd*, 1928. **Electrical Utilities, Ltd.**

The Retail Radio Trade.

I feel that there are one or two further comments to be added to those expressed in the trade Press, before a wrong impression is gained regarding the situation existing between the W.R.A. and the R.M.A.

In my opinion, there is absolutely no valid reason for the R.M.A. to demand to see a list of the W.R.A. members, before it will even make arrangements for a preliminary meeting of representatives of the two bodies. Indeed, the attitude adopted might easily be construed to be an attempt to sidetrack the main issue.

If the R.M.A. as a body, presumably representing a number of important manufacturers, were definitely anxious to co-operate with the W.R.A., it would not bandy words, but get down to business and put forward its doubts and fears at a joint meeting of the two bodies.

Whether the R.M.A. likes it or not, the W.R.A. is with us and is going to stay with us, for, as the majority of traders have realised long ago, the only way to stem the ever-rising tide of price-cutters, dabblers, and similar blots on the landscape of the radio trade is to organise, organise, and organise again. This point of view is backed up by the fact that branches of the W.R.A. are being formed, or have been formed, to the immediate and substantial benefit of the traders in the vicinity.

While the W.R.A. is quite capable of carrying out its programme unaided, the time taken would be considerably shortened if the R.M.A. and the wholesalers' association (when formed) would co-operate. The programme is a simple one—the confinement of the radio trade to the radio trader—and if the R.M.A. refuses to help to attain that desirable end, then traders cannot be blamed for supposing that the programme does not meet with the aims and objects of the manufacturers as represented by the R.M.A. If that be the case, let the R.M.A. come out into the open and say so. The retailers will then know exactly where they stand.

Luckily, many manufacturers are broad-minded enough to co-operate individually with the W.R.A. seeing, as they do, the great advantage to be gained ultimately, if not at once.

May I remind the R.M.A. that Rome was not built in a day, nor will the radio trade be organised in a day; but there are people who have pledged themselves to see that it is organised, however long it takes.

Will the R.M.A. explain why its members supply certain large textile organisations in the North of England with radio goods at discounts which enable such organisations to re-sell to their employés at, roughly, 20 per cent. off list prices? Or, alternatively, why employés in corporation electricity undertakings can supply town councillors with receivers and components at trade terms? Its members may think such trade perfectly legitimate until they hear the retailers' point of view, and I submit that the only way to reach agreement on these and similar points is to co-operate with the recognised retailers' association.

No section of any trade can stand alone, and there must be mutual understanding and help between all sections of that trade if it is to prosper. Let us sink all these petty differences, therefore, let us realise the chaos into which inexperience and indifference have led us, and resolve to join forces for the common good. A new and better system must arise from such an effort to the benefit of every honest and right-minded man, be he manufacturer, factor, or retailer.

Sydney R. Wright,
Chairman, Bradford and District Branch, Wireless Retailers' Association of Great Britain.

Bradford, *April 27th*, 1928.

The Smelting of Tin Ore.

We should like to offer the following information to your correspondent, "Consumer's Engineer," ELECTRICAL REVIEW, April 20th.

In the first place, whilst there may have been furnaces built and still in use for the purpose stated, we do not know of any actual installation in this country. However, we should like to suggest that an electric shaft furnace could be built suitable for the smelting of tin ores. Provision could be made for packing carbon in the form of charcoal, say, with the charge for the reduction of the latter.

For this reason a furnace heated by nickel-chrome resistance wire is out of the question, as in the presence of carbon monoxide the wire disintegrates. We would suggest, therefore, that the furnace be heated by non-metallic resistance rods of the "Silit" or silicon-carbide type. By suitable connections these rods could be arranged to give an initial quick heat and then a continuous slow heat for the reduction process. The design of a furnace for this work would depend upon the quality of ore to be smelted and the method of handling it.

A short reference to the electric furnace for tin smelting is given in Stansfield's "The Electric Furnace," p. 344, second edition, and he gives in a footnote a reference, "R. S. Wile, 'Reduction of Tin Dross in an Electric Furnace,' Trans. Am. Electrochem. Soc., XVIII, 1910, p. 205."

We trust that this information will be of use to your correspondent.

For **R. M. Catterson-Smith,**
J. PLUMMER, A.C.G.I.

London, *April 24th*, 1928.

Single-pole Fuseboards.

The writer is always anxious to assist his fellows, but is rather surprised at the questions raised in your issue of April 27th by "Electron." Did it ever occur to your correspondent that under certain circumstances the neutral wire may become the "live" or phase wire? Double-pole switches, fuses, and distribution boards are not ornaments, and to-day these things are more essential than ever in view of the fact that we have so many adventurers in our midst. I would suggest that your correspondent should procure a copy of the rules of the Institution of Electrical Engineers, which will no doubt be available from his local supply company. The answers to both "Electron's" questions are in the negative.

A. Milne.

Glasgow, *April 28th*, 1928.

A Plea for Courtesy.

As a reader of the ELECTRICAL REVIEW for more than 20 years, I should like to draw your attention to the very slack and discourteous manner in which advertisers treat applicants for positions advertised in the REVIEW.

You very kindly offer to insert free of charge a notice when a post is filled, which notice often gives satisfaction to applicants, but one is sorry to note that only a limited few take advantage of this way of notifying unsuccessful candidates, and they are left in complete ignorance, incidentally hoping against hope that they will some day hear from the advertiser.

A surprising feature is that it is not only in the lower grades of the electrical industry that the above happens, but it occurs frequently with Urban District Councils, Corporations, and Public Institutions.

Apart from your offer to insert, surely it is not asking too much for the advertiser to give notice to unsuccessful candidates, in view of the fact that one hundred notices could be dispatched at a postage cost of 4s. 2d.

In my own case during the past two months I have taken the trouble to insert with my application a stamped addressed envelope for reply when the post is filled, if not successful, but courtesy is lacking in every case. If the successful candidate had to do his business in this manner, surely he would not hold the position to which he was appointed for many years before he was discharged for inefficiency.

Perhaps other readers will give similar testimony, but in any case may we request a little more consideration for those who are full of hope and who spend their time and energy in making out applications in good faith?

While we claim to be a highly technical and practical set of men as electrical engineers, do not let us forget the commercial side which entails a little common courtesy.

Hopeful.

April 21st, 1928.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Budget.

Mr. Churchill, the Chancellor of the Exchequer, introduced his Budget on April 25th. The main features of his proposals were to establish a fixed annual debt charge of £355,000,000, which, he said, would extinguish the entire debt, internal and external, in 50 years; to amalgamate the currency notes with the Bank of England note issue in the current financial year; and to give relief to industry by remitting three-fourths of the rates on productive industry, beginning with the rate-payment of October, 1929. Farm lands and buildings, after the rate payment of April to June, 1929, were to be completely and permanently relieved of all rates. Rating relief was to be given to the railways amounting to not less than £4,000,000 a year, to be concentrated on agricultural and heavy traffic. To finance this scheme, a duty of 4d. per gallon was to be imposed on imported hydro-carbon oils. This included petrol, kerosene, benzol, white spirit, and turpentine, but excluded heavy oils and lubricating oils. It was estimated to produce £14,000,000 this year; £17,800,000 next year; and thereafter to rise by about £1,250,000 a year. Several smaller alterations of duties and taxes were announced. Fuller reference to the proposals is made elsewhere in this issue.

Wireless Loop Direction-finding System.

On April 24th, Mr. DAY asked the President of the Board of Trade whether any decision had been arrived at by his Department, in conjunction with the Air Ministry and Trinity House, with reference to the question of establishing an experimental station for the purpose of investigations into the wireless loop direction-finding system.

Sir P. CUNLIFFE-LISTER said that the question was still under consideration, but he hoped that a decision would be reached on it very shortly.

Scientific Treatment of Coal.

On April 24th, Mr. SHINWELL asked the Secretary for Mines whether he could state the terms of the contract arranged with the Gas Light and Coke Company in respect of the scientific treatment of coal.

Commodore KING said that the necessary plant for a three years' trial on a commercial scale was being erected at Richmond, on a site provided by the company, by a company formed for the purpose, known as the Fuel Production Company. The latter company had received a guarantee under the Trade Facilities Act in respect of a loan of £100,000. The Gas Light and Coke Company would act as managers for the fuel company and bear all the running expenses, and had an option to purchase the plant at the end of three years. Steps had been taken to safeguard the public interest in any patents that might be taken out as a result of this experiment, and full details of the plant and of the results obtained would be made available.

Electricity Charges.

On April 26th, Mr. HANBURY asked the Minister of Transport what action he proposed to take with regard to the application which had been made by the Wandsworth Borough Council for the revision of the maximum prices which might be charged for electricity in that borough.

Col. ASHLEY said he had directed an inquiry to be held into the application of the Wandsworth Borough Council and certain consumers for a revision of the maximum prices.

Cost of Wireless "Beacons."

On April 24th, Mr. DAY asked what would be the individual cost of the three wireless "beacons" which were being erected at the Caskets, Lundy, and Start; when it was expected that they would be in operation; and whether it was proposed to erect any further wireless beacons around the coast.

Sir P. CUNLIFFE-LISTER said he was informed by the Trinity House that the estimated cost of the wireless beacons at the Caskets and Lundy would be about £4,000 each, and at Start about £3,500, and that the signals at the Caskets and Start would be in operation in about four months, and that at Lundy in about six months from the present time. Sanction had been given to the erection during the current financial year of further beacons at South Bishop, Dungeness and Cromer in England and Wales, and at Sule Skerry and Kinnaird Head in Scotland, and it was expected that sanction would shortly be given to two others in Ireland.

Reviews.

The Mollier Steam Tables and Diagrams. By DR. RICHARD MOLLIER. English Edition adapted and amplified from the Third German Edition by Dr. H. Moss. Pp. 53, with two charts, each 20¼ in. by 25¾ in. London: Longmans, Green & Co., Ltd. Price 7s. 6d. net.

Modern power-station practice with its larger turbo-generator units tends ever towards the adoption of higher initial steam pressures and temperatures, and it is therefore a matter of prime importance that the physical constants, such as the saturation temperature, specific volume, &c., for steam at these increased pressures and temperatures should be made available for the power-station engineer and the designer of power-station plant. Although not so spectacular, the last decade has also witnessed a considerable development in the science and practice of producing high condenser vacua in conjunction with large steam turbines, and at this end of the scale also a knowledge of the physical constants is essential. The work of the great physicist Regnault did not cover the conditions either of very high pressure or of very low pressure, and it is largely to Prof. Callendar in this country and to Dr. Mollier in Germany that we owe our present knowledge—still admittedly incomplete—of the properties of steam under the conditions which are met with in increasing frequency in modern power-station practice.

In this valuable little book Dr. Moss has given us the work of Dr. Mollier covering pressures right up to the critical value for steam, *viz.*, 3,200 lb. per sq. in., and superheat temperatures up to 500 deg. C. (932 deg. F.), the units having been converted from the continental or metric system to those in use by British engineers. Dr. Moss does not, however, carry his work of conversion right to its logical conclusion because, save for actual temperatures which are given in both the Centigrade and the Fahrenheit units, he is content to leave total heats in pound-calories rather than in the more familiar British thermal unit (B.th.u.), which is, of course, the pound-Fahrenheit unit. We are aware that the academicians cling obstinately to the use of the former, but the practical engineer clings with equal obstinacy to the latter, and, after all, the ultimate value of this book must depend upon the extent to which it is used by the more practical men in the profession.

Five complete tables in all are given. Two cover the properties of saturated steam, the first being based upon temperature and increasing by 5 deg. C. from zero to 374 deg. C. (705 deg. F.), which is the saturation temperature for steam at the critical pressure, and the second based upon pressure and ranging from 0.2 lb. per sq. in. absolute to the critical pressure, *i.e.*, 3,200 lb. per sq. in. In this second table we are pleased to find that the values are commendably close together between zero and 2 lb. per sq. in. (30 to 26 in. of mercury), which is the working range of vacua in modern condensing plant. The third table gives the specific volume of superheated steam at various pressures and at temperatures up to 500 deg. C. (932 deg. F.), the fourth covers the total heat, and the fifth the entropy, both for superheated steam under the same conditions as those in Table III. Brief chapters are included showing the methods of using the various tables for the solution of different problems, as well as for interpolating where the changes do not follow the straight line law, and finally there are the two large Mollier diagrams, or Total Heat-Entropy (Hϕ) charts. These are each 20¼ in. by 26¾ in., and are printed on good quality parchment paper folded and placed in a stiff pocket formed in the back cover of the book. Both diagrams are similar, except that, on the second, the lines of constant volume are shown in red.

We can thoroughly recommend these tables to all who are in any way concerned with the design and operation of steam turbine plant (and, indeed, to those who may have to deal with steam reciprocating engines) and who are desirous of investigating the theoretical possibilities of the boilers, engines and condensers in their charge.

Diesel Engine Running and Maintenance. By PHILIP H. SMITH. Pp. 159; figs. 87. London: Constable & Co., Ltd. Price 3s. 6d. net.

The development of the Diesel engine for driving electrical generators, particularly in small and isolated power stations, has given rise to a number of problems of different kinds which may be said to be peculiar to the operation of this kind of engine. Generally speaking, these problems are capable of a more or less easy solution or their appearance has led to such modifications in the design of Diesel engines that their incidence has gradually been eliminated. Nevertheless, in spite of the very great progress which has been made in the design and construction of heavy-oil internal-combustion engines in recent years, they must still be regarded as being difficult to run and to maintain—say, in comparison with a steam turbine—and engineers in power stations where Diesel-driven generators are installed will welcome the appearance of this eminently practical little book, which is devoted to the solution of those problems which arise during the running and overhaul of such machines.

The book, which is one of a series of "Practical Manuals for Practical Men," embodies a first-hand experience of Diesel engines extending over nearly a quarter of a century, and is intended to help the practical man to secure maximum reliability consistent with reasonable all-round economy in the operation of a Diesel-engine plant. The book deals particularly with land practice—although, of course, many of the arguments apply equally well to marine types of Diesel engine—and while it is written essentially for the man in the power station who is concerned with the actual running and maintenance, we venture to suggest that it could be studied with advantage by the designers of Diesel engines, since the author does not hesitate to indicate where various features of a design are faulty and liable to lead to trouble when the engine is in operation. The field covered by the 21 brief chapters into which the work is divided comprises every working detail of the engine itself as well as the auxiliaries, such as the fuel pumps, air compressors, &c., these being well illustrated by means of detail drawings, although we venture to suggest that these drawings could with advantage have been made somewhat larger. Space is also found to deal with the significance of the various routine jobs inseparable from the running of Diesel engines, such as valve setting, tuning up the engine, taking indicator diagrams, and so on. In this connection particular attention may be drawn to the chapters on exhaust temperatures in which the value of the figures obtained by this simple expedient is emphasised, and that on indicators and indicating, in which, by the reproduction of a series of typical diagrams, the significance of the form of the diagram is explained. These diagrams include not merely the usual "indicator card," but also light-spring diagrams, the draw card, and the compression-stroke diagram.

In a chapter on the selection of engine type—hardly germane to the problems of running and maintenance, perhaps—attention is drawn to the advantage of employing a large number of cylinders in order to obtain cyclic regularity of speed where alternators are driven in parallel, and the problem of the high-speed engine, such as the German submarine engines which have been successfully employed for driving electrical generators, is also discussed. The future of the small electric power station in which Diesel engines can most usefully be employed is rather obscure at the present time in view of the policy of the Electricity Commissioners, but it might be urged that the future of the Diesel-driven generator will depend very largely upon the extent to which the units at present in operation can be shown to be both economical in fuel consumption and cheap as regards running and maintenance charges. The former depends largely upon the designer, but the latter rests very largely with the power-station engineer, and the information contained in this very useful little book should prove of great value in enabling him to keep these charges down to a minimum.

The Call Indicator System of Automatic Telephony. By A. G. FREESTONE. Pp. xii+112; illustrated. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

To those who already possess a knowledge of the principles underlying the Strowger system of automatic telegraphy, and who desire to know the methods adopted to enable "manual" exchanges to be worked in conjunction with the automatic system during the period when the one is being converted to the other, this small handbook will be distinctly useful. The author has had the advantage of being allowed to use illustrations and drawings prepared by the Engineering Department of the Post Office, and hence the work may be taken as accurately representative of official methods.

The subjects dealt with include the call indicator repeater without transmission bridge; the coder; incoming rotary, line switch and position load distributor; position trunk set; decoding control switch; coder call indicator cord circuit; "Special Service" circuit; emergency manual circuit; C.C.I. repeater with transmission bridge, and the C.C.I. "routiner." There are 12 illustrations, 8 insets, and 7 plates.

The author adopts the excellent plan of first outlining the functions of the particular apparatus he is dealing with, and then proceeds to consider the operations in detail. By the aid of the diagrams and insets this task is greatly facilitated, and the reader should experience little or no difficulty in following the explanations given.

Although the book is intended primarily for students of telephony, it should appeal to a larger number of readers who may be interested to know how the intricate and complex operations of transference from the one system to the other are effected. It appears to be free from typographical or other errors, with the exception that on page 23, 17th line from the top, "leaves" should be "leave."

Automatic Telephony Simplified. By C. W. BROWN, A.M.I.E.E. Pp. viii+168; figs. 82. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

This small volume claims to be adapted to the needs of telephone engineering officers, traffic officers, and students who wish to acquire a sound knowledge of the principles and practice of automatic telephony as used in the British Post Office. The matter comprising it appeared originally as a series of articles in the *Telegraph and Telephone Journal*, and deals chiefly with the principles of the Strowger system, this particular system being the standard adopted by the Post Office.

There are, in all, eight chapters, followed by two appendices, in which the reader is led gradually from the simplest types of circuit to those of greater complexity. Beginning with an introductory chapter on switching, remote control, impulsing, &c., the author passes on to the elements of switching, diagrams and circuits, auxiliary lines, multi-exchange working, and large exchange areas. The excellent diagrams accompanying the letterpress do much to facilitate a comprehension of the successive steps in the various schemes outlined. This is noticeably the case in Chapter IV, on "Diagrams and Circuits."

The author, however, is not always sufficiently clear in his statements; *e.g.*, on page 2, he attributes the sluggish action of a particular relay to the "introduction of a mass of copper into the circuit." The mass of copper may be associated with the circuit, but it is not introduced *into* it. Again, on page 7, it is observed that the author spells "impedance" "impedence." This is probably a slip, but it would be well to have the spelling corrected. The work is excellently printed, and, as already remarked, the diagrams are well reproduced. A bibliography of works on automatic telephony is given in one of the two appendices, and will be found useful.

Electricity and the Motor Car. By F. H. HUTTON. Fifth Edition. Pp. viii+135; figs. 110. London: Iliffe & Sons, Ltd. Price 2s. 6d. net.

This book was specially written for the owner-driver, a class which has increased enormously and is being constantly augmented by the inclusion of new motorists, who rely largely upon such manuals for guidance in handling the complicated and unfamiliar mechanism which is concealed beneath an innocent-looking exterior. Electricity now plays so important and diversified a series of parts in the operation of a car that a working knowledge of the principles and construction of the electrical equipment is indispensable to the man who looks after his car himself, and he is fortunate in having at his disposal a hand-book so comprehensive and lucid as the one before us. It has been written in popular style, but without loss of accuracy, and having passed through several editions, its merits have been tried and proved; the new edition has been revised and brought up to date, and can be confidently recommended not only to the tyro but also to the more experienced user of a motor-car who wishes to improve his knowledge

Legal.

Lekto Phone Corporation v. Premier Electrical Stores.

MR. JUSTICE CLAUSON, in the Chancery Division on April 26th, had before him an action by the Lekto Phone Corporation, of Jersey City, U.S.A., against the Premier Electrical Stores, Shepherd's Bush, claiming an injunction restraining the alleged infringement of a patent for improvements in sound generating machines in connection with an appliance for sound reproduction in gramophones.

Mr. WHITEHEAD, K.C., for the plaintiffs, said the allegation was that the defendants had infringed the patent by selling a loud speaker which embodied the invention. The apparatus was in the form of a cone which did not require an amplifying instrument, and was capable of responding to high-frequency vibrations.

The defence was a denial of infringement, and allegations that the invention was not novel or useful, and that neither Mr. Marcus Clarence Hopkins, to whom the patent was granted, nor the plaintiffs were the first or true inventors.

Mr. MOULD, for the defendants, asked that the case should be adjourned so that the defence could be amended.

The defendants, in the course of their business, sold two loud speakers bought from the Telephon Fabrik Berliner, of Germany. The defendants were dependent on the wholesalers for the details necessary for the defence.

His LORDSHIP, in view of these circumstances, said he would order the action to stand over until May 22nd, and if, on or before May 17th, the defendants paid into Court 50 guineas as security for costs, the action could stand over generally with liberty for defendants to amend their defence.

General Radio Co., Ltd.

THE petition of H. Clarke & Co. (London), Ltd., for a compulsory winding-up order against the General Radio Co., Ltd., came before Mr. Justice Romer in the Companies' Winding-up Court on April 30th.

Mr. BEEBEE, for the petitioners, said the petition had been standing over to enable the company to carry through a certain sale. The negotiations for the sale had, however, fallen through. In the meantime the company had passed a resolution for voluntary liquidation, and the creditors had met and agreed to this. It had been arranged in the circumstances that no order should be made on the petition, except that the costs of the petition should be costs in the liquidation.

His LORDSHIP approved this arrangement.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

28,056. "Device for indicating and measuring the frequency of electrical oscillations." Radiofrequenz Ges. November 7th, 1925. (Addition to 252,170.) (261,040.)

28,058. "Piezo-electric resonance relay." Radiofrequenz Ges. November 7th, 1925. (Addition to 252,170.) (261,042.)

1927.

281. "Apparatus for charging secondary batteries." P. E. Fehr and A. C. Lock. January 5th, 1927. (288,363.)

541. "Automatic current limiting and regulating devices for use in electrical signalling." G. A. Mathieu. January 7th, 1927. (288,371.)

765. "Thermionic valve amplifiers." Standard Telephones and Cables, Ltd. (Bell Telephones and Cables, Inc.). January 10th, 1927. (288,379.)

1,748. "Telephone exchange components and their mounting." Sterling Telephone and Electric Co., Ltd., N. Blades and J. R. Beard. January 20th, 1927. (288,389.)

2,911. "Grid-biasing units fed by alternating current." H. Wade (Naamlooze Vennootschap 'Philips' Gloeilampenfabrieken). February 1st, 1927. (288,586.)

2,970. "Reels for receiving electrical cables and the like." S. W. Oglesby and Brehmer Folding Box Co., Ltd. February 2nd, 1927. (288,397.)

3,221. "Process of providing incandescent lamps or similar electric devices with getter material." S. G. S. Dicker. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). February 4th, 1927. (288,399.)

3,915. "Ignition magneto with stationary magnets and armature." R. B. Soc. des Magnetos. September 6th, 1926. (Patent of addition not granted.) (276,949.)

4,597. "Cabinets for loud-speakers of wireless receiving sets." R. I. Denham. February 18th, 1927. (288,407.)

4,831. "Distributors for magneto-electric machines." British Thomson-Houston Co., Ltd., L. Griffiths and F. A. Fossey. February 21st, 1927. (288,410.)

5,222. "Commutating gear for use with high-voltage electrical apparatus." J. E. Calverley and W. E. Highfield. February 24th, 1927. (288,415.)

7,950. "Electrical apparatus for testing motor vehicle and other mechanical power-transmission mechanisms." F. W. Highfield and Highfield Electrical Co., Ltd. March 22nd, 1927. (288,427.)

11,084. "Vibrating members for loud-speakers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 14th, 1926. (271,059.)

12,083. "Apparatus for synchronising alternating-current circuits." British Thomson-Houston Co., Ltd. May 5th, 1926. (Addition to 263,869.) (270,736.)

12,689. "Manufacture of triodes or other thermionic discharge tubes having several electrodes." Soc. La Radiotechnique. June 23rd, 1926. (273,255.)

13,797. "Electrical relays." General Railway Signal Co. July 27th, 1926. (275,170.)

16,311. "Electric mercury-vapour apparatus and the like." General Electric Co., Ltd., and E. Weintraub. June 19th, 1926. (272,558.)

16,475. "Locally fusing metals by the electric arc process and electric arc welding." British Thomson-Houston Co., Ltd. June 25th 1926. (273,297.)

17,809. "Voltaic cells." Frigamin Ges. January 14th, 1927. (283,559.)

22,616. "Apparatus for the production of laminated electric insulators, condensers, and the like." M. Polanyi and S. Von Bogdandy. August 22nd, 1927. (288,474.)

24,298. "Lighting equipment." C. K. Mills (Frank Co., Inc.). September 15th, 1927. (288,481.)

24,490. "Automatic controlling devices for electric motors and the like." R. Lagniez. September 16th, 1926. (277,687.)

24,557. "Incandescent electric lamp caps." F. Conradty and O. Conradty (trading as C. Conradty, firm of). June 24th, 1927. (288,484.)

26,080. "Apparatus for registering the time integral for a quantity varying with the time." Telefonaktiebolaget L. M. Ericsson. October 9th, 1926. (278,707.)

26,117. "Processes and apparatus for forging and roughing-out iron and steel bars by electricity." E. Giacchino. October 3rd, 1927. (288,488.)

26,560. "Electric switches." British Thomson-Houston Co., Ltd. October 23rd, 1926. (279,428.)

31,414. "Electric incandescent lampholder." E. C. R. Marks (H. Römmler Akt. Ges.). November 22nd, 1927. (288,506.)

1928.

7,120. "Electric motor for the separate drive of looms for weaving and other like machines." A. Martin. March 7th, 1927. (286,653.)

7,267. "Electrostatic protecting covering of cable cores." Felten and Guilleaume Cariswerk Akt. Ges. March 9th, 1927. (286,676.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 25th:—

Bandcox (lettering and design). No. 486,643. Class 8. Radio receiving sets and parts therefor.—Crossley Radio Corporation, Cincinnati, O., U.S.A. (British representative: Frank B. Dehn, 103, Kingsway, W.C.2.)

Comparavisor, No. 488,777, and Vocevisor, No. 488,778. All goods in Class 8.—Radiovisor, Ltd., 26, Church Street, Cambridge Circus, W.C.1.

Nia, Ltd. (lettering and design). No. 488,164. Class 15. Lighting fittings and shades.—N.I.A. Lighting, Ltd., 57-58, Wells Street, W.1.

Lucullus. No. 489,300. Class 18. Electric, coal and gas stoves and heating appliances.—Cookers & Geysers, Ltd., 244, High Holborn, W.C.1.

Genasco (lettering and design). No. 485,555. Class 50. Bituminous insulating paper, asphaltic compound for sealing electrical batteries, &c.—The Barber Asphalt Co., 1,600 Arch Street, Philadelphia, U.S.A. (British representative: Frank B. Dehn, 103, Kingsway, W.C.2.)

M.E.T.A. Summer Meeting.

The Meter Engineers' Technical Association will hold its summer meeting this year at Leamington Spa on May 19th. The programme includes lunch at the Crown Hotel, followed by an address by the president, a visit to the Spa and a motor tour to Warwick and Stratford-on-Avon. Application for accommodation should be made to the hon. secretary not later than May 5th.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AYR.—County Council buildings; county clerk.

BATLEY.—Departmental store, West Ardsley, Batley Co-operative Society; Hustler & Taylor, architects, Ropergate, Pontefract.

BIRKENHEAD.—Out-patients' department, General Hospital; Edmund Kirby & Sons, architects, 5, Cook Street, Liverpool.

BRADFORD.—Re-instatement after fire (£3,000); John Pilley and Sons, wool warehouse, Eccleshill.

BRIGHTON.—Pier improvements; Palace Pier Co. Motor showrooms, 21, Bedford Square; University Motors, Ltd. Rehousing scheme, Hereford Street; borough engineer. Twenty-five houses, Baden Road; Braybons, Ltd. Alterations, Royal Spa, Queen's Park; Hooper, Struve and Co., Ltd.

BURTON-ON-TRENT.—Premises for Co-operative Wholesale Society; Architect's Department, Balloon Street, Manchester.

CHEADLE.—Primitive Methodist Church, Kingsley Hill; trustees.

CHORLEY.—Headquarters, Library Street; St. John Ambulance Association.

CLIPSTONE.—All Saints' Church; L. Ambler, architect; J. F. Booth, builder.

CLOWNE.—Housing scheme (30), for the R.D.C.; J. Haslam, architect, Ryton Chambers, Bridge Street, Worksop.

COLCHESTER.—Showrooms and workshops, East Hill; F. G. Smith (Motors), Ltd. Elementary school, Lexden; Education Committee.

CROYDON.—Housing scheme (154), for the T.B.; borough engineer (returnable deposit of £3 3s. in each case, Upper Norwood scheme and Mitcham Road Estate scheme).

DARLINGTON.—School (440 places), for the Borough E.C.; H. Hopkins, clerk.

DERBY.—Extensions to nurses' home, Royal Infirmary, Walker & Slater, Ltd., builders.

DOVER.—Extensions, Biggin Street; Dover and District Co-operative Society, Ltd. Alterations, 62-63, Biggin Street; F. W. Woolworth & Co., Ltd.

ECCLESTON (ST. HELENS, LANCS.).—Re-erection of "Ingleholme," Eccleston Park, residence of F. R. Dixon-Nuttall.

ELLESMERE PORT.—Elementary school, £25,000; Cheshire Education Committee.

FARNHAM.—House, Castle Hill; Sir E. M. Perceval.

GILLINGHAM (DORSET).—Headquarters for the Territorial Army Association; F. T. Maltby, architect, Dorchester (returnable deposit of £3 3s.).

GLASGOW.—Forty-one houses, Weddlerlea Drive, Cardonald; D. Paul. Church, Knightswood Road; Baptist Church of Scotland.

GODALMING.—Re-erection of Wey Valley Wool Works, Peasmarsh, for Louis Major (£16,000).

GRAVESEND.—Warehouse extensions, Church Street; Robert Hopkins & Sons.

GUILDFORD.—Alterations and additions, Archbishop Abbott's School; Governors. School, Bellfields, for the Borough E.C.; director of education.

HALIFAX.—Alterations to Prospect Mills, Ovenden; G. Reg. Oddy, architect, Ward's End Chambers.

HEAGE.—Housing scheme (24), for the U.D.C.; A. J. Fortnam, surveyor, New Bridge Road, Ambergate (returnable deposit of £2 2s.).

HERTFORD.—Showrooms and offices, Parliament Row, for the North Metropolitan Electric Power Supply Co., Ltd.

IRISH FREE STATE (DRUMCONDRA, DUBLIN).—Fifty houses, Griffith Avenue, for the Dublin Commercial Public Utility Society, Ltd.; MacDonnell, Dixon & Downes, architects, 20, Ely Place, Dublin.

(MULLINGAR, CO. WESTMEATH).—Alterations to County Home and Hospitals for the County Board of Health; Mr. O'Reilly, engineer to the Board.

LANCASTER.—100 houses, Halton Estate; F. Moore & Co.

LEEDS.—Conversion of Mental Block into Children's Block, Rothwell Institution; J. N. Ford, clerk to the Guardians, Poor Law Offices, 11, South Parade.

LEICESTER.—Premises, Southgate Street; Birmingham and Midland Motor 'Bus Co. Extensions, Isolation Hospital; city engineer. Abattoir (£72,000); R. Stephen Ayling, architect.

LEIGH.—Grammar school; Lancashire Education Committee.

LONDON (BARKING TOWN, E.).—Additions, factory, Abbey Road; P. C. Henderson, Ltd.

LONDON (*continued*).—

(HACKNEY, E.).—Post office and telephone exchange, Patagon Road; Triangular Construction Co. Synagogue, Grove Lane; G. Coles.

(SEVEN KINGS, E.).—Methodist Church (£4,250); trustees.

(POPLAR, E.).—Buildings, Buchanan's Wharf, Emmett Street; C. Dunch. Flats, Gale Street; borough engineer. Flats, Priory Road; J. S. Broadbent.

(FINCHLEY, N.).—Catholic school, Bow Lane; T. H. B. Scott, architect.

(HORNSEY, N.).—Y.M.C.A. Institute, Tottenham Lane; H. Baily.

(ST. PANCRAS, N.W.).—Reconstruction, 12-26, Osnaburg Street; C. T. Armstrong. Reconstruction, 58-60, Whitfield Street; Ernest H. Abbott.

(CATFORD, S.E.).—Church, Burnt Ash Hill; H. Guy Holt.

(LEWISHAM, S.E.).—Rebuilding premises; Messrs. Sainsbury, The Obelisk.

(BATTERSEA, S.W.).—Additional storey, Town Hall; borough engineer.

(WESTMINSTER, S.W.).—Buildings between 27 & 33, Knightsbridge; Paul de Artime.

(BRONDESBURY, W.).—Secondary school, The Avenue; Middlesex Education Committee.

(ACTON, W.).—Secondary school, Heathfield Estate; Middlesex Education Committee.

MAIDSTONE.—School, Mangravet Estate, for the Borough E.C.; T. F. Bunting, borough surveyor (returnable deposit of £2 2s.).

MANSFIELD.—Conversion of Sweetville Hall into police station and courthouse for Notts C.C.; clerk.

MARCH.—Housing scheme (20), for the U.D.C.; W. Fovargue, architect, The Causeway (returnable deposit of £2 2s.). Business premises, Dartford Road, for S. Pilgrim (several thousand pounds).

MOSSLEY.—Co-operative Stores; C.W.S. architect, 1, Balloon Street, Manchester (returnable deposit of £1 1s.).

NEWCASTLE.—Forty-six houses, Lonnen Estate; city architect.

NEW FERRY.—Elementary school (£25,500); Cheshire Education Committee.

NORTHAMPTON.—Housing scheme (74), for the T.C.; Alfred Fidler, borough engineer (returnable deposit of £5).

NOTTINGHAM.—Houses (2,500) at Basford; T. C. Howitt, architect, 58-59, Long Row.

NUNEATON.—Hosiery factory (electrically equipped), Meadow Street, for Pool, Lorrimer & Tabberer, Ltd. (£20,000 to £30,000).

PETERBOROUGH.—Fifty-three houses, Nichols Estate; borough engineer.

PRESTON.—Junior school (300 places), for the Borough E.C.; director of education.

RAYLEIGH.—Weir Hotel (£11,000), for A. H. White; Owen H. Cockrill, architect, Southend-on-Sea.

REIGATE.—Additional 50 houses for the R.D.C.; surveyor.

SIDMOUTH.—Church (£5,000); trustees.

SOUTHPORT.—Church of S.S. Simon and Jude (£16,000); Rev. O. C Goold, vicar.

SOUTH STONEHAM (HANTS).—Housing scheme (22), for the R.D.C.; surveyor.

STAFFORD.—Primitive Methodist Church and school, Green Heath; trustees.

STOKE-ON-TRENT.—198 houses, Stoke Lodge housing site; R. Scrivener & Sons, architects, Howard Place, Hanley. First section of parish church (£50,000); Sir G. G. Scott, architect.

STOURBRIDGE.—School, Enville Street, for Worcestershire E.C.; A. V. Rowe, county architect, 38, Foregate Street, Worcester.

THETFORD.—Re-erection of Lynford Hall, used as the Australian Farms Training College; Professor Potts, principal (many thousand pounds).

THORNTON.—Central school; Lancashire Education Committee.

TUNSTALL.—Development, Chell Green Estate; Chatterley Whitfield Collieries, Ltd.

TYNEMOUTH.—Sea bank improvements (£50,000); borough engineer.

UDDINGSTON.—Housing scheme (28), for Lanarkshire C.C.; P. C. Smith, district offices, Hamilton.

UPMINSTER (ESSEX).—Extensions, Parish Church (£4,997); William Bell & Sons, builders, Saffron Walden.

WEST BROMWICH.—Fire station; A. D. Greatorex, borough engineer. First section, Charlemont School (deposit £1 1s.); Buckland & Haywood, architects, Norwich Union Chambers, Birmingham.

WIDNES.—Secondary school (£58,000); Lancashire Education Committee.

WINDSOR.—Cinema, Thames Street (£40,000), for the Windsor Playhouse, Ltd.